Appendix F
Impacts of Pit Disassembly and Conversion Options

APPENDIX F
IMPACTS OF PIT DISASSEMBLY AND CONVERSION OPTIONS

This appendix to this *Final Surplus Plutonium Disposition Supplemental Environmental Impact Statement* (*SPD Supplemental EIS*) addresses impacts from the construction and operation of specific facilities at the Savannah River Site (SRS) and Los Alamos National Laboratory (LANL) that may be used for pit disassembly and conversion. The options for pit disassembly and conversion addressed in this appendix may involve the use of multiple facilities at SRS and LANL, and are as follows:

- *PDCF at F-Area at SRS* (*PDCF Option*) – Pit disassembly and conversion would principally occur at a newly constructed Pit Disassembly and Conversion Facility (PDCF) within F-Area at SRS. In accordance with previous U.S. Department of Energy (DOE) decisions (see below), pits containing 2 metric tons (2.2 tons) of plutonium would be disassembled and the plutonium converted to plutonium oxide at the Plutonium Facility (PF-4) at LANL, and shipped to SRS.
- *PDC at K-Area at SRS* (*PDC Option*) – Pit disassembly and conversion would principally occur at a newly constructed Pit Disassembly and Conversion Project (PDC) that would be installed in existing buildings within K-Area at SRS.[1] As under the PDCF Option, pits containing 2 metric tons (2.2 tons) of plutonium would be disassembled and converted to plutonium oxide at PF-4 at LANL, and shipped to SRS.
- *PF-4 at LANL and MFFF at SRS* (*PF-4 and MFFF Option*) – Pit disassembly would occur at PF-4 at LANL. Conversion of plutonium metal to plutonium oxide may occur at PF-4, or plutonium metal may be shipped from LANL to the Mixed Oxide Fuel Fabrication Facility (MFFF) at SRS, where the plutonium metal would be converted to plutonium oxide in furnaces installed in MFFF.
- *PF-4 at LANL and H-Canyon/HB-Line and MFFF at SRS* (*PF-4, H-Canyon/HB-Line, and MFFF Option*) – Pit disassembly would occur at PF-4 at LANL and at the K-Area Complex at SRS. Pits disassembled at LANL would be converted to plutonium oxide at PF-4, or sent to SRS in metallic form to be converted to plutonium oxide at H-Canyon/HB-Line or in metal oxidation furnaces installed in MFFF. Pits disassembled at the K-Area Complex would be sent to H-Canyon/HB-Line for conversion to plutonium oxide.

Under all four pit disassembly and conversion options, the analyses in this appendix only address those activities and impacts attributable to pit disassembly or conversion at a given facility, and do not address other activities such as plutonium disposition that may be performed at the same facility. For example, the impacts presented in this appendix for MFFF are for optional conversion of pit plutonium to an oxide using metal oxidation furnaces installed in MFFF, rather than for fabrication of plutonium oxide into mixed oxide (MOX) fuel. Impacts from MOX fuel fabrication at MFFF are addressed in Appendix G.

Under both the PF-4 and MFFF Option and the PF-4, H-Canyon/HB-Line, and MFFF Option, metal oxidation furnaces could be installed at MFFF during MFFF construction or during MFFF operation.

Under the PF-4, H-Canyon/HB-Line, and MFFF Option, the precise quantities of plutonium that may be processed among the plutonium facilities at SRS and LANL are not known. Therefore, the analyses for this option are conservatively conducted assuming maximum plutonium throughputs for each SRS and LANL plutonium facility. This assumption results in a conservative level of impacts assessed under this option. Appendix B, Table B–3, provides the plutonium throughputs for each facility.

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[1] *PDC could also be used to prepare non-pit plutonium for mixed oxide fuel fabrication or surplus pit and non-pit plutonium for disposal at the Waste Isolation Pilot Plant as contact-handled transuranic waste (see Appendix B, Section B.1.2.2).*

Details about the pit disassembly and conversion options are provided in Chapter 2, Section 2.1; details about the plutonium disposition options are provided in Section 2.2; and details about the *SPD Supplemental EIS* alternatives are provided in Section 2.3. Appendix B provides descriptions of the SRS and LANL facilities that may be used for pit disassembly and conversion, while Appendix E addresses the environmental impacts from shipments of radioactive and non-radioactive materials and waste. Appendix G addresses the environmental impacts from the options for plutonium disposition; Appendix H, the environmental impacts from the principal support facilities needed for pit disassembly and conversion and plutonium disposition; and Appendix I, the environmental impacts from the use of MOX fuel in commercial nuclear power reactors. Chapter 4 addresses the environmental impacts of the *SPD Supplemental EIS* alternatives.

Pit disassembly and conversion of 2 metric tons (2.2 tons) of plutonium at PF-4 at LANL is ongoing, in accordance with National Environmental Policy Act (NEPA) decisions reached through the *Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico* (*DOE/EIS-0380*) (*LANL SWEIS*) (DOE 2008a) and its Record of Decision (ROD) (75 *Federal Register* [FR] 55833). The minor upgrades to PF-4 to support this activity, currently underway, are summarized in Appendix B, Section B.2.1, and were assessed as part of the *LANL SWEIS* analysis. Impacts from these upgrades are therefore not addressed further in this appendix. Modifications to PF-4 to enable an enhanced pit disassembly and conversion capability (applicable to the PF-4 and MFFF and PF-4, H-Canyon/HB-Line, and MFFF Options), however, could involve modification to or decontamination and decommissioning of several existing gloveboxes, as well as installation of additional gloveboxes (LANL 2013). These modifications are expected to result in minor environmental impacts and are addressed in this appendix. Impacts from operation of PF-4 under all pit disassembly and conversion options are also addressed in this appendix.

F.1 Air Quality

Nonradioactive air pollutant impacts under each pit disassembly and conversion option are evaluated in this section. Radioactive air pollutant impacts are evaluated in Section F.2.

Activities under the pit disassembly and conversion options could result in criteria, hazardous, and toxic air pollutant emissions from facility construction and operation. **Table F–1** shows estimated air pollutant concentrations at site boundaries from construction of, or modifications to, optional pit disassembly and conversion facilities, and compares the concentrations to applicable standards and significance levels. In this table, columns on the left provide impacts on a facility-specific basis, while columns on the right provide combined impacts for one or more facilities as appropriate for each pit disassembly and conversion option.[2]

Significance levels are concentrations below which no further analysis is necessary for that pollutant for the purpose of permitting. Concentrations above significance levels would need to undergo further analysis to consider the cumulative impacts from other sources within the impact area (EPA 1990:C28; Page 2010a, 2010b; 40 CFR 51.165(b) (2)). Where modeling was performed for this *SPD Supplemental EIS*, current U.S. Environmental Protection Agency (EPA) models were used. For example, the EPA AERMOD dispersion model (EPA 2004) was used unless stated otherwise. As required, updated emissions and concentrations were determined based on information provided in cited references.

[2] *This format is used to present information in several tables throughout this appendix.*

Table F–1 Estimated Air Pollutant Concentrations at Site Boundary from Construction of, or Modifications to, Pit Disassembly and Conversion Facilities

Pollutant	Averaging Period	More Stringent Standard for SRS [a]	More Stringent Standard for LANL [a]	Significance Level [b] (micrograms per cubic meter)	Facilities					Pit Disassembly and Conversion Options			
					SRS				LANL				
					PDCF	PDC	HC/HBL [c]	MFFF [d]	PF-4 [e]	PDCF	PDC	PF-4 and MFFF (SRS/LANL)	PF-4, HC/HBL, and MFFF (SRS/LANL)
Criteria Pollutants (micrograms per cubic meter)													
Carbon monoxide	8 hour	10,000	7,900	500	120	73	NC	NC	23	120	73	NC / 23	NC / 23
	1 hour	40,000	11,900	2,000	170	104	NC	NC	33	170	104	NC/ 33	NC / 33
Nitrogen dioxide	Annual	100	75	1	0.19	0.01	NC	NC	3.4	0.19	0.01	NC / 3.4	NC / 3.4
	1 hour	188	150	7.5	110	44	NC	NC	69	110	44	NC / 69	NC / 69
PM_{10}	24 hour	150	150	5	14	0.17	NC	NC	1.6	14	0.17	NC / 1.6	NC / 1.6
$PM_{2.5}$ [f]	Annual	15	15	0.3	0.17	0.0015	NC	NC	0.2	0.17	0.0015	NC / 0.2	NC / 0.2
	24 hour	35	35	1.2	14	0.17	NC	NC	1.6	14	0.17	NC / 1.6	NC / 1.6
Sulfur dioxide	Annual	80	42	1	0.0002	0.001	NC	NC	0.0037	0.0002	0.001	NC / 0.0037	NC / 0.0037
	24 hour	365	209	5	0.02	0.01	NC	NC	0.03	0.02	0.01	NC / 0.03	NC / 0.03
	3 hour	1,300	1,050	25	NR	NR	NC	NC	0.066	NR	NR	NC / 0.066	NC / 0.066
	1 hour	197	152	7.8	0.3	0.2	NC	NC	0.074	0.3	0.2	NC / 0.074	NC / 0.074

HC/HBL = H-Canyon/HB-Line; LANL = Los Alamos National Laboratory; MFFF = Mixed Oxide Fuel Fabrication Facility; NC = no change; NR = not reported; PDC = Pit Disassembly and Conversion Project; PDCF = Pit Disassembly and Conversion Facility; PF-4 = Plutonium Facility; PM_n = particulate matter less than or equal to *n* microns in aerodynamic diameter; SRS = Savannah River Site.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period.

[b] EPA 1990; Page 2010a, 2010b; 40 CFR 51.165(b) (2).

[c] Optional modifications to H-Canyon/HB-Line to support plutonium conversion to an oxide form, and to the K-Area Complex to enable pit disassembly, are expected to result in minimal additional emissions of air pollutants from these operational facilities.

[d] Optional installation of metal oxidation furnaces at MFFF is expected to result in minimal air emissions.

[e] The listed values are for minor modifications to PF-4 to support pit disassembly and conversion of 35 metric tons (38.6 tons) of plutonium.

[f] Emissions of PM_{10} were used to represent $PM_{2.5}$ emissions when $PM_{2.5}$ emission factors were not available (SRNS 2012).

Note: Diesel construction equipment would also emit various hazardous air pollutants and lead. These emissions and resulting concentrations would be small and have not been quantified.

Source: DOE/NNSA 2012; LANL 2013; NMAC 20.2.3; SRNL 2013; SRNS 2012; 40 CFR Part 50.

The maximum concentration values presented in the tables of this section are the highest 1st-high concentration calculated at a specific receptor, except for the nitrogen dioxide 1-hour values. Use of the highest 1st-high concentration is appropriate for comparison with significance levels. However, use of the highest 1st-high concentration is not appropriate for use with all ambient air quality standards. Ambient air quality standards use different methods for evaluating the number of exceedances allowed before the standard is considered not to be met. The basis for compliance with the 1-hour nitrogen dioxide standard is a 3-year average of the 98th percentile of the daily maximum 1-hour average. EPA guidance (EPA 2011) on demonstrating compliance with the 1-hour nitrogen dioxide National Ambient Air Quality Standards (NAAQS) is to use the eighth-highest of the daily maximum 1-hour value (not the highest 1-hour value) as an unbiased surrogate for the 98th percentile.

Peak year air pollutant emissions from construction of, or modification to, pit disassembly and conversion facilities at SRS are presented in **Table F–2**, where tabulated concentrations for PDCF are applicable under the PDCF Option; PDC under the PDC Option; PF-4 and MFFF under the PF-4 and MFFF Option; and PF-4, H-Canyon/HB-Line, and MFFF under the PF-4, H-Canyon/HB-Line, and MFFF Option.

Table F–2 Peak Year Air Pollutant Emissions from Construction of, or Modifications to, Pit Disassembly and Conversion Facilities

	Facilities (metric tons per year)				
	SRS				*LANL*
Pollutant	***PDCF***	***PDC***	***H-Canyon/HB-Line*** [a]	***MFFF*** [b]	***PF-4 at LANL*** [c]
Carbon monoxide	35	26	NC	NC	0.12
Nitrogen dioxide	37	20	NC	NC	0.25
PM_{10}	32	5	NC	NC	0.015
$PM_{2.5}$ [d]	31	4.5	NC	NC	0.015
Sulfur dioxide	0.072	0.044	NC	NC	<0.001
Volatile organic compounds	7.1	4.3	NC	NC	0.034

LANL = Los Alamos National Laboratory; MFFF = Mixed Oxide Fuel Fabrication Facility; NC = no change; PDC = Pit Disassembly and Conversion Project; PDCF = Pit Disassembly and Conversion Facility; PF-4 = Plutonium Facility; PM_n = particulate matter less than or equal to *n* microns in aerodynamic diameter; SRS = Savannah River Site.

[a] Optional modifications to H-Canyon/HB-Line, and to the K-Area Complex to enable pit disassembly, are expected to result in minimal additional emissions of air pollutants from these operational facilities.

[b] Optional installation of metal oxidation furnaces at MFFF is expected to result in minimal air emissions.

[c] The listed values are based on fuel use data provided in LANL 2013, associated with minor modifications to PF-4 needed to support pit disassembly and conversion of 35 metric tons (38.6 tons) of plutonium.

[d] Emissions of PM_{10} were used to represent $PM_{2.5}$ emissions when $PM_{2.5}$ emission factors were not available (SRNS 2012).

Note: To convert metric tons to tons, multiply by 1.1023.

Source: DOE/NNSA 2012; LANL 2013; SRNL 2013; SRNS 2012.

The emissions presented in Table F–2 account for fugitive emissions from earth-moving activities, emissions from construction equipment exhaust, and onsite vehicle emissions. Emissions from installation of metal oxidation furnaces in MFFF and modifications to H-Canyon/HB-Line are expected to be minimal and would consist primarily of fugitive dust and nitrogen oxides from portable generators (SRNS 2012). Emissions at LANL from preparing a 2-acre (0.8 hectare) area for a construction trailer and additional parking are also shown in Table F–2 (LANL 2013).

Estimated air pollutant contributions to concentrations at the site boundary from facility operations are presented in **Table F–3.** Sources of air pollutants associated with operations include boilers that provide heating for plutonium management activities. The table includes the most recent estimates of concentrations from operation of PDCF.

Table F–3 Estimated Air Pollutant Concentrations at Site Boundary from Operation of Pit Disassembly and Conversion Facilities

Pollutant	*Averaging Period*	*More Stringent Standard for SRS* [a]	*More Stringent Standard for LANL* [a]	*Significance Level* [b] *(micrograms per cubic meter)*	*Facilities*					*Pit Disassembly and Conversion Options*			
					SRS				*LANL*				
					PDCF	*PDC*	*HC/HBL* [c]	*MFFF* [d]	*PF-4*	*PDCF*	*PDC*	*PF-4 and MFFF (SRS/LANL)*	*PF-4, HC/HBL and MFFF (SRS/LANL)*
Criteria Pollutants (micrograms per cubic meter)													
Carbon monoxide	8 hour	10,000	7,900	500	14	12.6	NC	NC	NC	14	12.6	NC / NC	NC / NC
	1 hour	40,000	11,900	2,000	67	44.7	NC	NC	NC	67	44.7	NC / NC	NC / NC
Nitrogen dioxide	Annual	100	75	1	0.041	0.042	NC	NC	NC	0.041	0.042	NC / NC	NC / NC
	1 hour	188	150	7.5	116 [e]	73 [e]	NC	NC	NC	250	170	NC / NC	NC / NC
PM_{10} [f]	24 hour	150	150	5	0.49	0.61	NC	NC	NC	0.49	0.61	NC / NC	NC / NC
$PM_{2.5}$ [g]	Annual	15	15	0.3	0.001	0.001	NC	NC	NC	0.001	0.001	NC / NC	NC / NC
	24 hour	35	35	1.2	0.33	0.47	NC	NC	NC	0.33	0.47	NC / NC	NC / NC
Sulfur dioxide	Annual	80	42	1	0.0001	0.001	NC	NC	NC	0.0001	0.001	NC / NC	NC / NC
	24 hour	365	209	5	0.009	0.23	NC	NC	NC	0.009	0.23	NC / NC	NC / NC
	3 hour	1,300	1,050	25	NR	NR	NC	NC	NC	NR	NR	NC / NC	NC / NC
	1 hour	197	152	7.8	0.12	3.6	NC	NC	NC	0.12	3.6	NC / NC	NC / NC

HC/HBL = H-Canyon/HB-Line; LANL = Los Alamos National Laboratory; MFFF = Mixed Oxide Fuel Fabrication Facility; NC = no change; NR = not reported; PDC = Pit Disassembly and Conversion Project; PDCF = Pit Disassembly and Conversion Facility; PF-4 = Plutonium Facility; PM_n = particulate matter less than or equal to *n* microns in aerodynamic diameter; SRS = Savannah River Site.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period.

[b] EPA 1990; Page 2010a, 2010b; 40 CFR 51.165(b) (2).

[c] Negligible change in emissions would occur from pit disassembly at the K-Area Complex, or from conversion of plutonium at HC/HBL, from those from current operation of either facility.

[d] Plutonium metal would be converted to plutonium oxide using oxidation furnaces installed at MFFF. Emissions from operation of the furnaces would result in negligible change in emissions from the entire MFFF which are presented in Appendix G, Table G-1.

[e] 8^{th}-highest maximum 1-hour nitrogen dioxide concentration is presented for comparison to the ambient standard.

[f] The PM_{10} annual standard was revoked by the EPA.

[g] Emissions of PM_{10} were used to represent $PM_{2.5}$ emissions when $PM_{2.5}$ emission factors were not available (SRNS 2012).

Source: DOE/NNSA 2012; LANL 2013; SRNL 2013; SRNS 2012.

F.1.1 PDCF at F-Area at SRS

Construction—At SRS, construction-related impacts could result from nonradioactive air pollutant emissions from construction of PDCF. PDCF construction activities would emit particulate matter and other pollutants from operation of diesel-powered construction equipment and a concrete batch plant, as well as vehicles. PDCF, as currently designed, would require more land for construction than that analyzed in the *Surplus Plutonium Disposition Final Environmental Impact Statement (SPD EIS)* (DOE 1999). Earthmoving and other construction activities are expected to result in emissions higher than those estimated in the *SPD EIS*. Estimated maximum nonradioactive air pollutant concentrations at the SRS site boundary from construction of PDCF are presented in Table F–1. Exterior activities would result in small quantities of fugitive dust and other emissions from activities such as excavation and paving (SRNS 2012). As shown in Table F–1, the calculated 1-hour nitrogen dioxide, PM_{10} [particulate matter less than or equal to *n* microns in aerodynamic diameter] 24-hour, and $PM_{2.5}$ 24-hour concentrations for PDCF construction would be greater than the significance levels. Because these concentrations exceed the significance levels, before construction of PDCF could be permitted, additional analysis would be required. At LANL, there would be no new construction at PF-4 that could result in additional nonradioactive air pollutant emissions.

Operations—At SRS, Table F–3 indicates that, except for nitrogen dioxide 1-hour average concentrations, the contributions of PDCF to concentrations of criteria pollutants are below significance levels.

Emissions from diesel generators were included in the air quality impact analyses, and are represented in the results for PDCF in Table F–3. Generators operating less than 250 hours per year are considered insignificant sources and are exempt from Title V permitting (SRNS 2010).

At LANL, there would be no additional emissions of criteria or nonradioactive toxic air pollutants from PF-4 pit disassembly and conversion activities (LANL 2013). This is because operational emissions would be linked primarily to testing of diesel generators for the entire PF-4; this testing would occur essentially independent of pit disassembly and conversion activities at PF-4.

F.1.2 PDC at K-Area at SRS

Construction—At SRS, construction-related impacts could result from nonradioactive air pollutant emissions from construction of PDC. Estimated maximum nonradioactive air pollutant concentrations at the SRS site boundary from PDC construction are presented in Table F–1. With the exception of a 30-acre (12-hectare) construction site, construction of PDC would occur mostly inside the K-Area reactor building. Exterior activities would result in small quantities of fugitive dust and other emissions from activities such as excavation and paving (SRNS 2012). As shown in Table F–1, the calculated 1-hour nitrogen dioxide concentration for PDC construction is greater than the nitrogen dioxide significance level (7.5 micrograms per cubic meter) but less than the ambient air quality standard for SRS (188 micrograms per cubic meter). Because this concentration exceeds the nitrogen dioxide significance level, additional analysis could be required before construction of PDC could be permitted. At LANL, there would be no new construction at PF-4 that could result in additional nonradioactive air pollutant emissions.

Operations—At SRS, Table F–3 indicates that, except for nitrogen dioxide 1-hour average concentrations, the contributions of PDC operations to concentrations of criteria pollutants are below significance levels. Because the 1-hour nitrogen dioxide concentration exceeds the nitrogen dioxide significance level, before operation of PDC could be permitted, additional analysis could be required.

Emissions from diesel generators were included in the air quality impact analyses, and are represented in the results for PDC in Table F–3. An existing emergency diesel generator for the K-Area Complex emits air pollutants. Generators operating less than 250 hours per year are considered insignificant sources and are exempt from Title V permitting (SRNS 2010). Other than emissions from diesel generators, there would be minimal emissions of other nonradioactive air pollutants from operation of PDC. These would include small amounts of fluorides, hydrochloric acid, nickel and nickel oxide, and beryllium and beryllium oxide (SRNS 2012; WSRC 2008a). Mitigation of air pollutants and protection of workers are discussed in Chapter 4, Sections 4.9.4 and 4.9.6, respectively.

At LANL, as under the PDCF Option (Section F.1.1), there would be no additional emissions of criteria or nonradioactive toxic air pollutants from PF-4 pit disassembly and conversion activities (LANL 2013).

F.1.3 PF-4 at LANL and MFFF at SRS

Construction—At SRS, emissions of nonradioactive air pollutant emissions from installation of metal oxidation furnaces at MFFF are expected to be minimal. At LANL, emissions from preparing a 2-acre (0.8 hectare) area for a construction trailer and additional parking are also shown in Table F–1 and are expected to be minimal with the exception of the 1-hour and annual nitrogen dioxide and 24 hour $PM_{2.5}$ concentrations which are lower than the standards but higher than the significance levels (LANL 2013). Because these concentrations exceed the significance levels, before construction at PF-4 could be permitted, additional analysis could be required.

Operations—At SRS, it is expected that operation of metal oxidation furnaces at MFFF would not contribute incrementally to air pollutant emissions from MFFF; this is because emissions from MFFF are dominated by emissions from periodic testing of diesel generators at MFFF, which would occur regardless of the presence or absence of metal oxidation furnaces at the facility. At LANL, there would be no additional emissions of criteria or nonradioactive toxic air pollutants from PF-4 pit disassembly and conversion activities (LANL 2013). This is because operational emissions would be linked primarily to testing of diesel generators for the entire PF-4; and the test schedule and frequency is not expected to increase with the larger pit disassembly and conversion throughput at PF-4 addressed under this option.

F.1.4 PF-4 at LANL and H-Canyon/HB-Line and MFFF at SRS

Construction—At SRS, emissions from installation of metal oxidation furnaces at MFFF would be the same as those in Section F.1.3 under the PF-4 and MFFF Option. No changes in emissions are projected from the K-Area Complex from modifications to enable pit disassembly, or from modifications to H-Canyon/HB-Line to support pit plutonium conversion to plutonium oxide. At LANL, emissions from modifications to PF-4 would be the same as those in Section F.1.3 under the PF-4 and MFFF Option.

Operations—At SRS, emissions from the K-Area Complex and H-Canyon/HB-Line operations are not expected to change from current levels as a result of the proposed pit disassembly and conversion activities. Emissions from operation of metal oxidation at MFFF would be the same as those in Section F.1.3 under the PF-4 and MFFF Option. At LANL, emissions from pit disassembly and conversion activities would be the same as those in Section F.1.3 under the PF-4 and MFFF Option.

F.2 Human Health

F.2.1 Normal Operations

The following subsections present the potential incident-free radiological impacts on workers and the general public that could occur from each of the pit disassembly and conversion options at SRS and LANL. Human health risks from construction and normal operations are evaluated for individual and population groups, including onsite involved workers, a hypothetical maximally exposed individual (MEI) at the site boundary, and the regional population. Appendix C contains the detailed analysis of human health effects from normal operations.

Tables F–4 and **F–5** summarize the potential radiological impacts from operations on involved workers and the general public, respectively, under the pit disassembly and conversion options evaluated in this *SPD Supplemental EIS*. To facilitate a comparison of impacts between these options, the estimated annual doses and latent cancer fatality (LCF) risks over the life of the facilities are presented. Total impacts on workforces and the public over a given facility's operating time frame are determined by multiplying the annual impacts by the projected operating period of the given facility that may be used to support pit disassembly and conversion (see Appendix B, Table B–2). At both SRS and LANL, doses to actual workers would be monitored and maintained below administrative control levels through the implementation of engineered controls, administrative limits, and ALARA (as low as reasonably achievable) programs.

Table F–4 Potential Radiological Impacts on Involved Workers from Pit Disassembly and Conversion Options

	Facilities					*Pit Disassembly and Conversion Options*			
	SRS				*LANL*				
Impact	*PDCF*	*PDC*	*HC/HBL* [a]	*MFFF* [b]	*PF-4* [c]	*PDCF* [d]	*PDC* [d]	*PF-4 and MFFF* [d]	*PF-4, HC/HBL, and MFFF* [d]
Total Workforce									
Number of radiation workers									
at SRS	383	383	100 / 50	35	–	383	383	35	185
at LANL	–	–	–	–	85 / 345	85	85	345	345
Annual collective dose (person-rem per year)									
at SRS	190	190	29 / 28	2.3	–	190	190	2.3	59
at LANL	–	–	–	–	29 / 190	29	29	190	190
Annual latent cancer fatalities [e]									
at SRS	0 (1×10^{-1})	0 (1×10^{-1})	0 (2×10^{-2}) / 0 (2×10^{-2})	0 (1×10^{-3})	-	0 (1×10^{-1})	0 (1×10^{-1})	0 (1×10^{-3})	0 (4×10^{-2})
at LANL	–	–	–	–	0 (2×10^{-2}) / 0 (1×10^{-1})	0 (2×10^{-2})	0 (2×10^{-2})	0 (1×10^{-1})	0 (1×10^{-1})
Life-of-project latent cancer fatalities [e]									
at SRS	1 (1.4)	1 (1.4)	0 (0.2) / 0 (0.2)	0 (0.03)	–	1 (1.4)	1 (1.4)	0 (0.03)	1 (0.5)
at LANL	–	–	–	–	0 (0.1) / 3 (2.5)	0 (0.1)	0 (0.1)	3 (2.5)	3 (2.5)
Average Worker									
Annual dose (millirem per year) [f]									
at SRS	500	500	290 / 560	65	–	500	500	65	320
at LANL	–	–	–	–	340 / 560	340	340	560	560
Annual latent cancer fatality risk									
at SRS	3×10^{-4}	3×10^{-4}	2×10^{-4} / 3×10^{-4}	4×10^{-5}	–	3×10^{-4}	3×10^{-4}	4×10^{-5}	2×10^{-4}
at LANL	–	–	–	–	2×10^{-4} / 3×10^{-4}	2×10^{-4}	2×10^{-4}	3×10^{-4}	3×10^{-4}
Life-of-project latent cancer fatality risk									
at SRS	4×10^{-3}	4×10^{-3}	2×10^{-3} / 5×10^{-3}	8×10^{-4}	–	4×10^{-3}	4×10^{-3}	8×10^{-4}	3×10^{-3}
at LANL	–	–	–	–	1×10^{-3} / 7×10^{-3}	1×10^{-3}	1×10^{-3}	7×10^{-3}	7×10^{-3}

HC/HBL = H-Canyon/HB-Line; LANL = Los Alamos National Laboratory; MFFF = MOX Fuel Fabrication Facility; PDC = Pit Disassembly and Conversion Project; PDCF = Pit Disassembly and Conversion Facility; PF-4 = Plutonium Facility; SRS = Savannah River Site.

[a] Pit disassembly would occur in a K-Area Complex glovebox and dissolution and oxidation would occur at H-Canyon/HB-Line. In the column, the first value addresses impacts at H-Canyon/HB-Line while the second value addresses impacts at the K-Area Complex glovebox.

[b] Pit conversion would occur in MFFF using metal oxidation furnaces; all plutonium sent to MFFF would be made into MOX fuel.

[c] The first value is for pit disassembly and conversion of 2 metric tons (2.2 tons) of plutonium at LANL; the second value is for pit disassembly and conversion of 35 metric tons (38.6 tons) of plutonium at LANL.

[d] The values listed for the PDCF Option are applicable to all alternatives in this *SPD Supplemental EIS*; the values listed for the PDC Option are applicable under the MOX Fuel, H-Canyon/HB-Line to DWPF, and WIPP Alternatives; the values listed for the PF-4 and MFFF and PF-4, H-Canyon/HB-Line, and MFFF Options are applicable under all action alternatives.

[e] The integer indicates the number of excess LCFs expected in the workforce population based on a risk factor of 0.0006 LCFs per person-rem (DOE 2003); the values in parentheses are the values calculated using the risk factor.

[f] Engineering and administrative controls would be implemented to maintain individual worker doses below 2,000 millirem per year, and as low as reasonably achievable (10 CFR Part 835).

Note: Risks are rounded to one significant figure, except that two significant figures are provided for information when the calculated value exceeds one.

– A dash indicates that the facility or option is not relevant at the indicated DOE site.

Values are derived from analyses presented in Appendix C.

Table F–5 Potential Radiological Impacts on the Public from Pit Disassembly and Conversion Options

Impact	*Facilities*					*Pit Disassembly and Conversion Options*			
	SRS				*LANL*				
	PDCF	*PDC*	*HC/HBL* [a]	*MFFF* [b]	*PF-4* [c]	*PDCF* [d]	*PDC* [d]	*PF-4 and MFFF* [d]	*PF-4, HC/HBL, and MFFF* [d]
Population Within 50 Miles (80 Kilometers)									
Annual dose (person-rem)									
at SRS	0.46	0.44	0.26	0.37	–	0.46	0.44	0.37	0.63
at LANL	–	–	–	–	0.025/0.21	0.025	0.025	0.21	0.21
Annual latent cancer fatalities [e]									
at SRS	0 (3×10^{-4})	0 (3×10^{-4})	0 (2×10^{-4})	0 (2×10^{-4})	–	0 (3×10^{-4})	0 (3×10^{-4})	0 (2×10^{-4})	0 (4×10^{-4})
at LANL	–	–	–	–	0 (2×10^{-5}) / 0 (1×10^{-4})	0 (2×10^{-5})	0 (2×10^{-5})	0 (1×10^{-4})	0 (1×10^{-4})
Life-of-project latent cancer fatalities [e]									
at SRS	0 (3×10^{-3})	0 (3×10^{-3})	0 (2×10^{-3})	0 (4×10^{-3})	–	0 (3×10^{-3})	0 (3×10^{-3})	0 (4×10^{-3})	0 (6×10^{-3})
at LANL	–	–	–	–	0 (1×10^{-4}) / 0 (3×10^{-3})	0 (1×10^{-4})	0 (1×10^{-4})	0 (3×10^{-3})	0 (3×10^{-3})
Maximally Exposed Individual									
Annual dose (millirem)									
at SRS	0.0055	0.0061	0.0024	0.0041	–	0.0055	0.0061	0.0041	0.0065
at LANL	–	–	–	–	0.0097 / 0.081	0.0097	0.0097	0.081	0.081
Annual latent cancer fatality risk									
at SRS	3×10^{-9}	4×10^{-9}	1×10^{-9}	2×10^{-9}	–	3×10^{-9}	4×10^{-9}	2×10^{-9}	4×10^{-9}
at LANL	–	–	–	–	6×10^{-9} / 5×10^{-8}	6×10^{-9}	6×10^{-9}	5×10^{-8}	5×10^{-8}
Life-of-project latent cancer fatality risk									
at SRS	3×10^{-8} to 4×10^{-8}	4×10^{-8}	2×10^{-8}	5×10^{-8}	–	3×10^{-8} to 4×10^{-8}	4×10^{-8}	5×10^{-8}	7×10^{-8}
at LANL	–	–	–	–	4×10^{-8} / 1×10^{-6}	4×10^{-8}	4×10^{-8}	1×10^{-6}	1×10^{-6}
Average Exposed Individual									
Annual dose (millirem)									
at SRS	0.00053	0.00054	0.00029	0.00043	–	0.00053	0.00054	0.00043	0.00072
at LANL	–	–	–	–	5.6×10^{-5} / 4.7×10^{-4}	5.6×10^{-5}	5.6×10^{-5}	4.7×10^{-4}	4.7×10^{-4}
Annual latent cancer fatality risk									
at SRS	3×10^{-10}	3×10^{-10}	2×10^{-10}	3×10^{-10}	–	3×10^{-10}	3×10^{-10}	3×10^{-10}	4×10^{-10}
at LANL	–	–	–	–	3×10^{-11} / 3×10^{-10}	3×10^{-11}	3×10^{-11}	3×10^{-10}	3×10^{-10}
Life-of-project latent cancer fatality risk									
at SRS	3×10^{-9} to 4×10^{-9}	4×10^{-9}	2×10^{-9}	5×10^{-9}	–	3×10^{-9} to 4×10^{-9}	4×10^{-9}	5×10^{-9}	7×10^{-9}
at LANL	–	–	–	–	2×10^{-10} / 6×10^{-9}	2×10^{-10}	2×10^{-10}	6×10^{-9}	6×10^{-9}

HC/HBL = H-Canyon/HB-Line; LANL = Los Alamos National Laboratory; MFFF = Mixed Oxide Fuel Fabrication Facility; PDC = Pit Disassembly and Conversion Project; PDCF = Pit Disassembly and Conversion Facility; PF-4 = Plutonium Facility; SRS = Savannah River Site.

[a] Pit disassembly would occur in a K-Area Complex glovebox and dissolution and oxidation would occur at H-Canyon/HB-Line. The dominant emissions would be from activities at H-Canyon/HB-Line. Negligible incremental offsite impacts are expected from activities at the K-Area Complex glovebox.

[b] Pit conversion would occur in MFFF using metal oxidation furnaces; all plutonium sent to MFFF would be made into MOX fuel.

[c] The first value is for pit disassembly and conversion of 2 metric tons (2.2 tons) of plutonium at LANL; the second value is for pit disassembly and conversion of 35 metric tons (38.6 tons) of plutonium at LANL.

[d] The values listed in the column for the PDCF Option are applicable to all alternatives in this *SPD Supplemental EIS*; the values listed in the column for the PDC Option are applicable under the MOX Fuel, H-Canyon/HB-Line to DWPF, and WIPP Alternatives; the values listed in the columns for the PF-4 and MFFF and PF-4, H-Canyon/HB-Line, and MFFF Options are applicable under all action alternatives.

[e] The integer indicates the number of excess LCFs that is expected in the population based on the risk factor of 0.0006 LCFs per person-rem (DOE 2003); the values in parentheses are the values calculated using the risk factor.

Note: Risks are rounded to one significant figure. Sums in the table may differ from those calculated from table entries due to rounding.

– A dash indicates that the facility or option is not relevant at the indicated DOE site.

Values are derived from analyses presented in Appendix C.

F.2.1.1 PDCF at F-Area at SRS

Construction—At SRS, an annual average of 341 construction workers is estimated for construction of PDCF. These workers are not expected to receive any incremental exposures above those of the general SRS population.

Construction of PDCF would not result in radiological impacts on the general population at the site boundary and beyond.

At LANL, there would be no new construction under this option and therefore no additional radiological impacts on workers or the public.

Operations—At SRS, the collective worker dose under the PDCF Option would be about 190 person-rem per year, with no additional LCFs. Over the life of the project the collective dose to workers would result in 1 (1.4) LCF. The average annual dose per full-time-equivalent worker under this option would be approximately 500 millirem, with a corresponding risk of the worker developing a latent fatal cancer of 3×10^{-4}, or 1 chance in about 3,300. The total LCF risk per full-time-equivalent worker over the life of this option would be about 4×10^{-3}, or 1 chance in 250 of an LCF.

For normal operation of PDCF, the annual population dose would be about 0.46 person-rem. This dose is a small fraction (less than 0.0002 percent) of the dose the same population would receive from natural background radiation. Radiological emissions over the duration of this option are estimated to result in no LCFs in the population surrounding SRS (calculated value: 3×10^{-3} LCF).

The dose for a hypothetical MEI residing at the closest point accessible to the public outside the SRS boundary from 1 year of pit disassembly and conversion operations under this option would be 0.0055 millirem, or about 0.002 percent of the dose from natural background radiation. The annual risk of a latent fatal cancer associated with this dose would be about 3×10^{-9}, or about 1 chance in 330 million. The total risk of a latent fatal cancer to the MEI from the dose received over the life of this option would be from 3×10^{-8} to 4×10^{-8}, depending on the alternative and corresponding years of operation. In other words, there is 1 chance in about 25 million, or less, that the MEI would develop a latent fatal cancer from exposures received over the life of the project under this option.

At LANL, the collective worker dose under the PDCF Option would be about 29 person-rem per year, with no additional LCFs (calculated value: 2×10^{-2} LCF). Over the life of the project the collective dose to workers would result in no additional LCFs (calculated value: 0.1 LCFs). The average annual dose per full-time-equivalent worker under this option would be approximately 340 millirem, with a corresponding risk of the worker developing a latent fatal cancer of 2×10^{-4}, or 1 chance in 5,000. The total LCF risk per full-time-equivalent worker over the life of this option would be about 1×10^{-3}, or 1 chance in 1,000 of an LCF.

For normal operation of PF-4, the annual population dose would be about 0.025 person-rem. This dose is a small fraction (less than 0.0001 percent) of the dose the same population would receive from natural background radiation. Radiological emissions over the duration of this option are estimated to result in no LCFs in the population surrounding LANL (calculated value: 1×10^{-4} LCF).

The dose for a hypothetical MEI residing at the closest point accessible to the public outside the LANL boundary from 1 year of pit disassembly and conversion operations under this option would be 0.0097 millirem, or about 0.002 percent of the dose from natural background radiation. The annual risk of a latent fatal cancer associated with this dose would be about 6×10^{-9}, or less than 1 chance in about 170 million. The total risk of a latent fatal cancer to the MEI from the dose received over the life of this option would be 4×10^{-8}. In other words, there is 1 chance in 25 million that the MEI would develop a latent fatal cancer from exposures received over the life of the project under this option.

F.2.1.2 PDC at K-Area at SRS

Construction—At SRS, it is possible that construction of PDC at K-Area could take place within areas that exhibit residual levels of contamination (limited demolition, removal, and decontamination actions were completed at K-Area in January 2008). PDC construction activities would include 2 years of decontamination and equipment removal. The 28 PDC workers involved in decontamination and equipment removal would receive an average annual dose of 18 millirem. This would result in a collective worker dose of 0.5 person-rem per year and a total dose of 1.0 person-rem over 2 years of decontamination and removal. No LCFs among the worker population are expected (calculated value: 6×10^{-4} LCF).

K-Area construction activities are not expected to result in any radiological impacts on the public.

At LANL, there would be no new construction under this option and therefore no additional radiological impacts on workers or the public.

Operations—At SRS, the collective worker dose under this option would be the same as those in Section F.2.1.1 under the PDCF Option.

For normal operation of PDC, the annual population dose would be about 0.44 person-rem. This dose is a small fraction (about 0.0002 percent) of the dose the same population would receive from natural background radiation. Radiological emissions over the duration of this option are estimated to result in no LCFs in the population surrounding SRS (calculated value: 3×10^{-3} LCF).

The dose for a hypothetical MEI residing at the closest point accessible to the public outside the SRS boundary from 1 year of pit disassembly and conversion operations would be 0.0061 millirem, or about 0.002 percent of the dose from natural background radiation. The annual risk of a latent fatal cancer associated with this dose would be about 4×10^{-9}, or 1 chance in 250 million. The total risk of a latent fatal cancer to the MEI from the dose received over the life of this option would be 4×10^{-8}. In other words, there is 1 chance in 25 million that the MEI would develop a latent fatal cancer from exposures received over the life of the project under this option.

At LANL, doses and risks to workers and the public would be the same as those in Section F.2.1.1 under the PDCF Option.

F.2.1.3 PF-4 at LANL and MFFF at SRS

Construction—At SRS, MFFF would be modified under this option to install metal oxidation furnaces. Approximately 140 construction workers (plus 135 engineering and other workers) would be involved over an estimated 3.5-year timeframe. Metal oxidation furnaces would be installed in an area set aside in MFFF (i.e., separate from the fuel fabrication operations), so construction workers would not be expected to receive any occupational radiation doses.

At LANL, potential construction activities at PF-4 (e.g., glovebox installations/modifications decontamination and decommissioning, and installation of equipment) are not expected to exceed an annual construction workforce dose of 18 person-rem per year to 60 workers, which equates to an average construction worker dose of 300 millirem per year. The annual risk of a latent fatal cancer associated with this average worker dose would be about 2×10^{-4}, or 1 chance in about 5,000. Over the 8-year life of the construction project, the collective worker dose could be up to 140 person-rem. These exposures are not expected to result in any additional LCFs (calculated value: 9×10^{-2} LCF).

Construction activities at SRS, such as the installation of metal oxidation furnaces at MFFF, would not result in radiological impacts on the public. At LANL, construction activities at PF-4 (e.g., glovebox installations/modifications, decontamination and decommissioning, and installation of equipment) would similarly not result in radiological impacts on the public.

Operations—At SRS, the collective worker dose under this option would be 2.3 person-rem per year, which would result in no annual LCFs among workers (calculated value: 1×10^{-3} LCF). Over the life of the project the collective dose to workers would also result in no LCFs. The average annual dose per full-time-equivalent worker under this option would be approximately 65 millirem at SRS, with a corresponding risk of the worker developing a latent fatal cancer of 4×10^{-5}, or 1 chance in 25,000. The total average LCF risk at SRS per full-time-equivalent worker over the life of this pit disassembly and conversion option would be about 8×10^{-4}, or 1 chance in 1,250 of an LCF.

For normal operation of metal oxidation furnaces at MFFF, the additional annual population dose would be about 0.37 person-rem. This dose is a small fraction (0.0001 percent) of the dose the same population would receive from natural background radiation. Radiological emissions at SRS over the duration of this pit disassembly and conversion option are estimated to result in no LCFs in the population surrounding SRS (calculated value: 4×10^{-3} LCF).

The dose for a hypothetical MEI residing at the closest point accessible to the public outside the SRS boundary from 1 year of pit disassembly and conversion operations under this option would be 0.0041 millirem, or about 0.001 percent of the dose from natural background radiation. The annual risk of a latent fatal cancer associated with this dose would be about 2×10^{-9}, or 1 chance in 500 million. The total risk of a latent fatal cancer to the MEI from the dose received over the life of this option would be 5×10^{-8}. In other words, there is 1 chance in 20 million that the MEI would develop a latent fatal cancer from exposures received over the life of the project under this option.

At LANL, the collective worker dose under this option would be about 190 person-rem per year, which would result in no annual LCFs among workers (calculated value: 0.1 LCF). Over the life of the project the collective dose to workers could result in 3 LCFs. The average annual dose per full-time-equivalent worker under this option would be approximately 560 millirem, with associated corresponding annual risks of the worker developing a latent fatal cancer of about 3×10^{-4} (about 1 chance in 3,300). The total average LCF risk per full-time-equivalent worker over the life of this pit disassembly and conversion option would be about 7×10^{-3} (about 1 chance in 140).

For normal operation of PF-4 at LANL, the additional annual population dose under this option would be about 0.21 person-rem. This dose is a small fraction (about 0.0001 percent) of the dose the same population would receive from natural background radiation. Radiological emissions at LANL over the duration of this pit disassembly and conversion option are estimated to result in no LCFs in the population surrounding LANL (calculated value: 3×10^{-3} LCF).

The dose for a hypothetical MEI residing at the closest point accessible to the public outside the LANL boundary from 1 year of pit disassembly and conversion operations under this option would be about 0.081 millirem, or about 0.02 percent of the dose from natural background radiation. The annual risk of a latent fatal cancer associated with this dose would be about 5×10^{-8}, or 1 chance in 20 million. The total risk of a latent fatal cancer to the MEI at LANL from the dose received over the life of this option would be 1×10^{-6}. In other words, there is 1 chance in 1 million that the MEI would develop a latent fatal cancer from exposures received over the life of the project under this option.

F.2.1.4 PF-4 at LANL and H-Canyon/HB-Line and MFFF at SRS

Construction—At SRS, construction workforce doses would result from modifications to the K-Area Complex to enable pit disassembly and to H-Canyon/HB-Line to enhance its existing capability to dissolve and oxidize plutonium for feed to MFFF. Modifications to the K-Area Complex could result in a collective dose of 2.0 person-rem per year to a construction workforce of 20 workers. Assuming 2 years for glovebox modifications, the collective dose would be about 4.0 person-rem. Doses are not expected to exceed 1.0 person-rem per year to 10 construction workers engaged in activities at H-Canyon/HB-Line (an average dose of 100 millirem per year). Over the 2 years of construction activities at H-Canyon/HB-Line the workforce would receive a collective dose of 2.0 person-rem. The total dose from modification activities at both facilities would be about 6 person-rem. No LCFs would be expected (calculated value: 4×10^{-3} LCF).

Construction efforts in support of adding the metal oxidation furnaces to MFFF would be the same as those discussed in Section F.2.1.3 under the PF-4 and MFFF Option.

At LANL, construction activities at PF-4 in support of proposed pit disassembly and conversion activities would be the same as those in Section F.2.1.3 under the PF-4 and MFFF Option.

At SRS, any potential construction activities, such as the installation of metal oxidation furnaces in MFFF or modification activities at the H-Canyon/HB-Line, would not result in radiological impacts on the public. At LANL, construction activities at PF-4 (e.g., glovebox installations/modifications/ decontamination and decommissioning, and installation of equipment) would similarly not result in radiological impacts on the public.

Operations—At SRS, the collective worker dose at SRS for pit disassembly at the K-Area Complex, activities in H-Canyon/HB-Line, and operation of the metal oxidation furnaces at MFFF would add 59 person-rem per year. This annual dose would result in no additional LCFs. Over the life of the project the collective dose to workers could result in 1 additional LCF (calculated value: 0.5).

The average annual dose per full-time-equivalent worker under this option would be approximately 320 millirem, with a corresponding risk of the worker developing a latent fatal cancer of about 2×10^{-4}, or 1 chance in 5,000. The total LCF risk at SRS per full-time-equivalent worker over the life of this option would be about 3×10^{-3}, or about 1 chance in 330 of an LCF.

For normal activities at H-Canyon/HB-Line associated with this option and operation of metal oxidation furnaces at MFFF at SRS, the additional annual population dose would be about 0.63 person-rem. This dose is a small fraction (approximately 0.0002 percent) of the dose the same population would receive from natural background radiation. Radiological emissions at SRS over the duration of this option are estimated to result in no LCFs in the population surrounding SRS (calculated value: 6×10^{-3} LCF).

The dose for a hypothetical MEI residing at the closest point accessible to the public outside the SRS boundary from 1 year of pit disassembly and conversion operations under this option would be 0.0065 millirem, or about 0.002 percent of the dose from natural background radiation. The annual risk of a latent fatal cancer associated with this dose would be about 4×10^{-9}, or 1 chance in 250 million. The total risk of a latent fatal cancer to the MEI at SRS from the dose received over the life of this option would be about 7×10^{-8}. In other words, there is about 1 chance in 14 million that the MEI would develop a latent fatal cancer from exposures received over the life of the project under this option.

At LANL, doses and risks to workers and the public would be the same as those in Section F.2.1.3 under the PF-4 and MFFF Option.

F.2.2 Accidents

The following subsections present the potential impacts on workers and the general public at SRS and LANL associated with possible accidents involving the pit disassembly and conversion options. Human health risks from these accidents are evaluated for several individual and population groups, including noninvolved workers, a hypothetical MEI at the site boundary, and the regional population. **Table F–6** summarizes the potential radiological impacts on the regional population, while **Table F–7** summarizes the potential radiological impacts on the MEI and a noninvolved worker. These impacts are associated with the facilities and processes that would be used under each of the four pit disassembly and conversion options. Impacts are presented as estimated doses and LCF risks from the accidents under consideration. (See Appendix D for further details on the accident analysis.) In both tables, the impacts at PF-4 at LANL under the PDCF and PDC Options reflect the pit disassembly and conversion of 2 metric tons (2.2 tons) of plutonium; the impacts under the PF-4 and MFFF and the PF-4, H-Canyon/HB-Line, and MFFF Options reflect the pit disassembly and conversion of 35 metric tons (38.6 tons) of plutonium.

Table F–6 Risks to the General Public within 50 Miles (80 kilometers) from Limiting Accidents Associated with Pit Disassembly and Conversion Options

	SRS Facilities								***LANL***		***Pit Disassembly and Conversion Options***							
	PDCF		***PDC***		***Metal Oxidation Furnaces at MFFF***		***H-Canyon/ HB-Line*** [a]		***PF-4*** [b]		***PDCF***		***PDC***		***PF-4 and MFFF***		***PF-4, H-Canyon/HB-Line, and MFFF***	
Accident	***Dose (person-rem)***	***LCFs***	***Dose (person-rem)***	***LCFs***	***Dose (person-rem)***	***LCFs***	***Dose (person-rem)***	***LCFs***	***Dose (person-rem)***	***LCFs***	***Dose SRS/LANL (person-rem)***	***LCFs SRS/ LANL***	***Dose SRS/LANL (person-rem)***	***LCFs SRS/ LANL***	***Dose SRS/LANL (person-rem)***	***LCFs SRS/ LANL***	***Dose SRS/LANL (person-rem)***	***LCFs SRS/ LANL***
Limiting design-basis accident	240	0.1	110	6×10^{-2}	0.067	4×10^{-5}	280	0.2	26	2×10^{-2}	240 / 26	0.1 / 2×10^{-2}	110 / 26	6×10^{-2} / 2×10^{-2}	0.067 / 26	4×10^{-5} / 2×10^{-2}	280 / 26	0.2 / 2×10^{-2}
Design-basis earthquake accidents [c, d]	91	5×10^{-2}	58	3×10^{-2}	0.0020	1×10^{-6}	280	0.2	71	4×10^{-2}	91 / 45	5×10^{-2} / 3×10^{-2}	58 / 45	3×10^{-2} / 3×10^{-2}	0.0020 / 71	1×10^{-6} / 4×10^{-2}	280 / 71	0.2 / 4×10^{-2}
Beyond-design-basis earthquake accidents [c, d]	7,900	5	6,300	4	670	0.4	15,000	9	4,300	3	7,900 / 3,800	5 / 2	6,300 / 3,800	4 / 2	670 / 4,300	0.4 / 3	15,000 / 4,300	9 / 3

LANL = Los Alamos National Laboratory; LCF = latent cancer fatality; MFFF = Mixed Oxide Fuel Fabrication Facility; PDC = Pit Disassembly and Conversion Project; PDCF = Pit Disassembly and Conversion Facility; PF-4 = Plutonium Facility; rem = roentgen equivalent man; SRS = Savannah River Site.

[a] Includes potential accidents involving a pit disassembly capability at the K-Area Complex.

[b] Impacts are shown for PF-4 assuming pit disassembly and conversion of 35 metric tons (38.6 tons) of plutonium. The doses assuming pit disassembly and conversion of 2 metric tons (2.2 tons) would be 26 person-rem for the limiting design-basis accident, 45 person-rem for the design-basis earthquake scenario, and 3,800 person-rem for the beyond-design-basis accident – earthquake-induced collapse plus fire scenario.

[c] Doses and risks to the public from design-basis and beyond-design-basis earthquakes with fire are added for the pit disassembly and conversion options across the SRS facilities that may be involved in pit disassembly and conversion.

[d] Except for metal oxidation furnaces at MFFF, the bounding design-basis and beyond-design-basis earthquake accidents at SRS are postulated to initiate fires within the affected facilities. The bounding design-basis and beyond-design-basis earthquake accidents at LANL are postulated to result in spills of nuclear material at PF-4 followed by fires.

Note: Values are derived from analyses presented in Appendix D.

Table F–7 Risks to the Maximally Exposed Individual and Noninvolved Worker from Limiting Accidents Associated with Pit Disassembly and Conversion Options

Accident	*SRS Facilities*								*LANL*		*Pit Disassembly and Conversion Options*							
	PDCF		*PDC*		*Metal Oxidation Furnaces at MFFF*		*H-Canyon/ HB-Line* [a]		*PF-4* [b]		*PDCF*		*PDC*		*PF-4 and MFFF*		*PF-4, H-Canyon/ HB-Line, and MFFF*	
	Dose (rem)	*LCF Risk*	*Dose (rem)*	*LCF Risk*	*Dose (rem)*	*LCF Risk*	*Dose (rem)*	*LCF Risk*	*Dose (rem)*	*LCF Risk*	*Dose SRS/ LANL (rem)*	*LCF Risk SRS/ LANL*	*Dose SRS/ LANL (rem)*	*LCF Risk SRS/ LANL*	*Dose SRS/ LANL (rem)*	*LCF Risk SRS/ LANL*	*Dose SRS/ LANL (rem)*	*LCF Risk SRS/ LANL*
Maximally Exposed Individual																		
Limiting design-basis accident	0.52	3×10^{-4}	0.33	2×10^{-4}	2.4×10^{-4}	1×10^{-7}	0.41	2×10^{-4}	0.11	7×10^{-5}	0.52 / 0.11	3×10^{-4} / 7×10^{-5}	0.33 / 0.11	2×10^{-4} / 7×10^{-5}	2.4×10^{-4} / 0.11	1×10^{-7} / 7×10^{-5}	0.41 / 0.11	2×10^{-4} / 7×10^{-5}
DBE accidents [c, e]	0.20	1×10^{-4}	0.18	1×10^{-4}	7.2×10^{-6}	4×10^{-9}	0.41	2×10^{-4}	0.30	2×10^{-4}	0.20 / 0.19	1×10^{-4} / 1×10^{-4}	0.18 / 0.19	1×10^{-4} / 1×10^{-4}	7.2×10^{-6} / 0.30	4×10^{-9} / 2×10^{-4}	0.41 / 0.30	2×10^{-4} / 2×10^{-4}
BDBE accidents [c, e]	19	1×10^{-2}	22	3×10^{-2}	2.4	1×10^{-3}	26	3×10^{-2}	18	1×10^{-2}	19 / 16	1×10^{-2} / 1×10^{-2}	22 / 16	3×10^{-2} / 1×10^{-2}	2.4 / 18	1×10^{-3} / 1×10^{-2}	28 / 18	3×10^{-2} / 1×10^{-2}
Noninvolved Worker																		
Limiting design-basis accident	4.5	3×10^{-3}	2.3	1×10^{-3}	5.4×10^{-3}	3×10^{-6}	1.6	9×10^{-4}	3.7	2×10^{-3}	4.5 / 3.7	3×10^{-3} / 2×10^{-3}	2.3 / 3.7	1×10^{-3} / 2×10^{-3}	0.0054 / 3.7	3×10^{-6} / 2×10^{-3}	1.6 / 3.7	9×10^{-4} / 2×10^{-3}
DBE accidents [d, e]	1.7	1×10^{-3}	1.2	7×10^{-4}	1.6×10^{-4}	1×10^{-7}	1.6	9×10^{-4}	10	6×10^{-3}	1.7 / 6.5	1×10^{-3} / 4×10^{-3}	1.2 / 6.5	7×10^{-4} / 4×10^{-3}	1.6×10^{-4} / 10	1×10^{-7} / 6×10^{-3}	1.6 / 10	9×10^{-4} / 6×10^{-3}
BDBE accidents [d, e, f]	720	1	770	1	61	7×10^{-2}	1,400	1	620	1	720 / 550	1 / 1	770 / 550	1 / 1	61 / 620	7×10^{-2} / 1	1,400 / 620	1 / 1

BDBE = beyond-design-basis earthquake; DBE = design-basis earthquake; LANL = Los Alamos National Laboratory; LCF = latent cancer fatality; MFFF = Mixed Oxide Fuel Fabrication Facility; PDC = Pit Disassembly and Conversion Project; PDCF = Pit Disassembly and Conversion Facility; PF-4 = Plutonium Facility; rem = roentgen equivalent man; SRS = Savannah River Site.

[a] Includes potential accidents involving a pit disassembly capability at the K-Area Complex.

[b] Impacts are assessed for PF-4 assuming pit disassembly and conversion of 35 metric tons (38.6 tons) of plutonium. The doses to the MEI and noninvolved worker assuming pit disassembly and conversion of 2 metric tons (2.2 tons) would be 0.11 and 3.7 rem for the limiting design-basis accident, 0.19 and 6.5 rem for the design-basis earthquake scenario, and 16 and 550 rem for the beyond-design-basis accident – earthquake-induced collapse plus fire scenario, respectively.

[c] Doses and risks to the MEI from the design-basis or beyond-design-basis earthquakes with fire are added for the pit disassembly and conversion options for the SRS facilities that may be involved in surplus plutonium disposition for the purposes of this analysis even though the MEI for accidents in K-Area would be different than the MEI near H-Area, for example.

[d] Doses and risks to noninvolved workers from the design-basis and beyond-design-basis earthquakes with fire are presented for the pit disassembly and conversion options for the highest dose to such an individual at a specific area since a noninvolved worker at the K-Area Complex would not be near H-Area should an accident occur there and vice versa.

[e] Except for metal oxidation furnaces at MFFF, the bounding design-basis and beyond-design-basis earthquake accidents at SRS are postulated to initiate fires within the affected facilities. The bounding design-basis and beyond-design-basis earthquake accidents at LANL are postulated to result in spills of nuclear material at PF-4 followed by fires.

[f] Individual doses in excess of 400 to 450 rem are assumed to result in a fatality.

Note: Values are derived from analyses presented in Appendix D.

F.2.2.1 PDCF at F-Area at SRS

The limiting design-basis accident at PDCF would be an over-pressurization of an oxide storage can in the facility. If this accident were to occur, the public residing within 50 miles (80 kilometers) of SRS would receive an estimated dose of 240 person-rem. This dose would result in no additional LCFs among the general public (calculated value: 0.1 LCF). The MEI would receive a dose of 0.52 rem which represents a risk to the MEI of developing a latent fatal cancer of 3×10^{-4}, or about 1 chance in 3,300. A noninvolved worker located 1,000 meters (3,300 feet) from the accident source at the time of the accident and who was unaware of the accident and failed to take any emergency actions would receive a dose of 4.5 rem with a risk of developing a latent fatal cancer of 3×10^{-3}, or about 1 chance in 330.

A design-basis earthquake with fire, involving F-Area when PDCF was operational, would expose the public residing within 50 miles (80 kilometers) of SRS to an estimated dose of 91 person-rem. This dose would result in no additional LCFs among the general public (calculated value: 5×10^{-2} LCF). The MEI would receive a dose of 0.20 rem which represents a risk to the MEI of developing a latent fatal cancer of 1×10^{-4}, or 1 chance in 10,000. A noninvolved worker would receive a dose of 1.7 rem with a risk of developing a latent fatal cancer of 1×10^{-3}, or 1 chance in 1,000.

A beyond-design-basis earthquake with fire, involving F-Area when PDCF was operational, would expose the public residing within 50 miles (80 kilometers) of SRS to an estimated dose of 7,900 person-rem. This dose could result in 5 additional LCFs among the general public. The MEI would receive a dose of 19 rem which represents a risk to the MEI of developing a latent fatal cancer of 1×10^{-2}, or 1 chance in 100. A noninvolved worker would receive a dose of 720 rem, which would likely result in a near-term fatality.

The limiting design-basis accident at PF-4 at LANL would be a hydrogen deflagration associated with dissolution of plutonium metal. If this accident were to occur, the public residing within 50 miles (80 kilometers) of LANL would receive an estimated dose of 26 person-rem. This dose would result in no additional LCFs among the general public (calculated value: 2×10^{-2} LCF). The MEI would receive a dose of 0.11 rem which represents a risk to the MEI of developing latent fatal cancer of 7×10^{-5}, or about 1 chance in 14,000. A noninvolved worker at the Technical Area 55 (TA-55) boundary would receive a dose of 3.7 rem with a risk of developing a latent fatal cancer of 2×10^{-3}, or 1 chance in 500. A design-basis earthquake with spill plus fire involving PF-4 would expose the public residing within 50 miles (80 kilometers) of LANL to an estimated dose of 45 person-rem. This dose would result in no additional LCFs among the general public (calculated value: 3×10^{-2} LCF). The MEI would receive a dose of 0.19 rem which represents a risk to the MEI of developing a latent fatal cancer of 1×10^{-4}, or 1 chance in 10,000. A noninvolved worker would receive a dose of 6.5 rem with a risk of developing a latent fatal cancer of 4×10^{-3}, or 1 chance in 250. A beyond-design-basis accident – earthquake-induced collapse plus fire[3] involving PF-4 would expose the public residing within 50 miles (80 kilometers) of LANL to an estimated dose of 3,800 person-rem. This dose would result in 2 additional LCFs among the general public. The MEI would receive a dose of 16 rem which represents a risk to the MEI of developing a latent fatal cancer of 1×10^{-2}, or 1 chance in 100. A noninvolved worker would receive a dose of 550 rem, which would likely result in a near-term fatality.

F.2.2.2 PDC at K-Area at SRS

The limiting design-basis accident at PDC would be an over-pressurization of an oxide storage can due to out-of-specification conditions that lead to a rupture resulting in a pressurized release of radioactive material. If this accident were to occur, the public residing within 50 miles (80 kilometers) of SRS would receive an estimated dose of 110 person-rem. This dose would result in no additional LCFs among the

[3] *For purposes of this* SPD Supplemental EIS, *a seismically initiated collapse of the roof and first floor of the PF-4 building, with widespread damage to containers causing spills and impacts from debris, followed by widespread fires involving much of the material at risk on the first floor, basement, and vaults is identified as the "Beyond-Design-Basis Accident – Earthquake-Induced Collapse plus Fire" scenario.*

general public (calculated value: 6×10^{-2} LCF). The MEI would receive a dose of 0.33 rem which represents a risk to the MEI of developing a latent fatal cancer of 2×10^{-4}, or 1 chance in 5,000. A noninvolved worker would receive a dose of 2.3 rem with a risk of developing a latent fatal cancer of 1×10^{-3}, or 1 chance in 1,000.

A design-basis earthquake with fire, involving K-Area when PDC was operational, would expose the public residing within 50 miles (80 kilometers) of SRS to an estimated dose of 58 person-rem. This dose would result in no additional LCFs among the general public (calculated value: 3×10^{-2} LCF). The MEI would receive a dose of 0.18 rem which represents a risk to the MEI of developing an LCF of 1×10^{-4}, or 1 chance in 10,000. A noninvolved worker would receive a dose of 1.2 rem with a risk of developing a latent fatal cancer of 7×10^{-4}, or about 1 chance in 1,400.

A beyond-design-basis earthquake with fire, involving K-Area when PDC was operational, would expose the public residing within 50 miles (80 kilometers) of SRS to an estimated dose of 6,300 person-rem. This dose could result in 4 additional LCFs among the general public. The MEI would receive a dose of 22 rem which represents a risk to the MEI of developing a latent fatal cancer of 3×10^{-2}, or about 1 chance in 33. A noninvolved worker would receive a dose of 770 rem, which would likely result in a near-term fatality.

The risks at PF-4 at LANL with respect to the proposed pit disassembly and conversion activities would be the same under this option as those under the PDCF Option (Section F.2.2.1).

F.2.2.3 PF-4 at LANL and MFFF at SRS

The limiting design-basis accident involving metal oxidation furnaces at MFFF at SRS would be a fire in a glovebox resulting in the pressurized release of radioactive material. If this accident were to occur, the public residing within 50 miles (80 kilometers) of SRS would receive an estimated dose of 0.067 person-rem. This dose would result in no additional LCFs among the general public (calculated value: 4×10^{-5} LCF). The MEI would receive a dose of 0.00024 rem which represents a risk to the MEI of developing a latent fatal cancer of 1×10^{-7}, or 1 chance in 10 million. A noninvolved worker would receive a dose of 0.0054 rem with a risk of developing a latent fatal cancer of 3×10^{-6}, or about 1 chance in 330,000.

A design-basis earthquake involving metal oxidation furnaces at MFFF would expose the public residing within 50 miles (80 kilometers) of SRS to an estimated dose of 0.0020 person-rem. This dose would result in no additional LCFs among the general public (calculated value: 1×10^{-6} LCF). The MEI would receive a dose of 0.0000072 rem which represents a risk to the MEI of developing a latent fatal cancer of 4×10^{-9}, or 1 chance in 250 million. A noninvolved worker would receive a dose of 0.00016 rem with a risk of developing a latent fatal cancer of 1×10^{-7}, or 1 chance in 10 million.

A beyond-design-basis earthquake with fire involving metal oxidation furnaces at MFFF would expose the public residing within 50 miles (80 kilometers) of SRS to an estimated dose of 670 person-rem. This dose would result in no additional LCFs among the general public (calculated value: 0.4 LCF). The MEI would receive a dose of 2.4 rem which represents a risk to the MEI of developing a latent fatal cancer of 1×10^{-3}, or 1 chance in 1,000. A noninvolved worker would receive a dose of 61 rem with a risk of developing a latent fatal cancer of 0.07, or about 1 chance in 14.

The limiting design-basis accident at PF-4 at LANL would be a hydrogen deflagration associated with dissolution of plutonium metal. If this accident were to occur, the public residing within 50 miles (80 kilometers) of LANL would receive an estimated dose of 26 person-rem. This dose would result in no additional LCFs among the general public (calculated value: 2×10^{-2} LCF). The MEI would receive a dose of 0.11 rem, which represents a risk to the MEI of developing latent fatal cancer of 7×10^{-5}, or about 1 chance in 14,000. A noninvolved worker at the TA-55 boundary would receive a dose of 3.7 rem with a risk of developing a latent fatal cancer of 2×10^{-3}, or 1 chance in 500.

A design-basis earthquake with spill plus fire involving PF-4 would expose the public residing within 50 miles (80 kilometers) of LANL to an estimated dose of 71 person-rem. This dose would result in no additional LCFs among the general public (calculated value: 4×10^{-2} LCF). The MEI would receive a dose of 0.30 rem which represents a risk to the MEI of developing a latent fatal cancer of 2×10^{-4}, or 1 chance in 5,000. A noninvolved worker would receive a dose of 10 rem with a risk of developing a latent fatal cancer of 6×10^{-3}, or 1 chance in 170.

A beyond-design-basis accident – earthquake-induced collapse plus fire involving PF-4 would expose the public residing within 50 miles (80 kilometers) of LANL to an estimated dose of 4,300 person-rem. This dose would result in 3 additional LCFs among the general public. The MEI would receive a dose of 18 rem which represents a risk to the MEI of developing a latent fatal cancer of 1×10^{-2}, or about 1 chance in 100. A noninvolved worker would receive a dose of 620 rem, which would likely result in a near-term fatality.

Changes to the analysis of potential accidents at LANL's PF-4 since the *Draft SPD Supplemental EIS* are presented in Appendix D; these changes resulted in the limiting design-basis accident being the same for all receptors and resulted in revised estimates of impacts from seismically induced accidents.

F.2.2.4 PF-4 at LANL and H-Canyon/HB-Line and MFFF at SRS

Risks involving metal oxidation furnaces at MFFF would be the same under this pit disassembly and conversion option as those under the PF-4 and MFFF Option (Section F.2.2.3). However, because there are other pit disassembly and conversion activities proposed at H-Canyon/HB-Line under this option, the doses associated with a design-basis and beyond-design-basis earthquake accident would include both facilities for the purposes of this accident analysis with respect to the public residing within 50 miles (80 kilometers) of SRS and the MEI. Noninvolved worker doses are presented for the highest dose to such an individual at a specific area since a noninvolved worker at F-Area would not be near H-Area should an accident occur there and vice versa.

The limiting design-basis accident involving pit disassembly activities at the K-Area Complex and conversion activities at H-Canyon/HB-Line at SRS would be a level-wide fire in HB-Line involving plutonium oxides and solutions. (Accidents involving the K-Area Complex pit disassembly operations would result in much lower source terms. See Appendix D.) If this accident were to occur, the public residing within 50 miles (80 kilometers) of SRS would receive an estimated dose of 280 person-rem. This dose would result in no additional LCFs among the general public (calculated value: 0.2 LCF). The MEI would receive a dose of 0.41 rem which represents a risk to the MEI of developing a latent fatal cancer of 2×10^{-4}, or 1 chance in 5,000. A noninvolved worker would receive a dose of 1.6 rem with a risk of developing a latent fatal cancer of 9×10^{-4}, or about 1 chance in 1,100.

A design-basis earthquake with fire involving both F-Area with metal oxidation furnaces at MFFF and H-Canyon/HB-Line would expose the public residing within 50 miles (80 kilometers) of SRS to an estimated dose of 280 person-rem (calculated value: 0.2 LCF). This dose would result in no additional LCFs among the general public. The MEI would receive a dose of 0.41 rem which represents a risk to the MEI of developing a latent fatal cancer of 2×10^{-4}, or 1 chance in 5,000. A noninvolved worker at H-Canyon/HB-Line would receive a dose of 1.6 rem with a risk of developing a latent fatal cancer of 9×10^{-4}, or about 1 chance in 1,100.

A beyond-design-basis earthquake with fire involving both F-Area with metal oxidation furnaces at MFFF and H-Canyon/HB-Line would expose the public residing within 50 miles (80 kilometers) of SRS to an estimated dose of 15,000 person-rem. This dose would result in 9 additional LCFs among the general public. The MEI would receive a dose of 26 rem which represents a risk to the MEI of developing latent fatal cancer of 0.03, or 1 chance in 33. A noninvolved worker at H-Canyon/HB-Line would receive a dose of 1,400 rem, which would likely result in a near-term fatality.

The risks at PF-4 at LANL with respect to the proposed pit disassembly and conversion activities would be the same under this option as those under the PF-4 and MFFF Option (Section F.2.2.3).

F.3 Socioeconomics

This section analyzes the potential socioeconomic impacts of different pit disassembly and conversion options. Impacts on direct and indirect employment, economic output, value added and earnings are presented for the peak years of construction for these facilities and for the surplus plutonium activities at these facilities during their peak years of operations. The area that would experience the impacts presented in this section is the region of influence (ROI) surrounding each facility. The socioeconomic ROI for the facilities at SRS is defined as the four-county area of Columbia and Richmond Counties in Georgia, and Aiken and Barnwell Counties in South Carolina. The socioeconomic ROI for PF-4 at LANL is defined as the four-county area of Los Alamos, Rio Arriba, Sandoval, and Santa Fe Counties in New Mexico. All values are presented in 2010 dollars. **Table F–8** presents the socioeconomic impacts that would be generated during the peak year of construction. **Table F–9** presents the socioeconomic impacts that would be generated during the peak year of operations.

Table F–8 Peak Annual Socioeconomic Impacts Associated with Construction of Pit Disassembly and Conversion Options

	Facilities					*Pit Disassembly and Conversion Options*			
	SRS				*LANL*				
Impact	*PDCF*	*PDC*	*H-Canyon/ HB-Line* [a]	*MFFF*	*PF-4* [b]	*PDCF*	*PDC*	*PF-4 and MFFF*	*PF-4, H-Canyon/ HB-Line, and MFFF*
Direct Employment	722	741	10	275	46	722	741	321	331
Indirect Employment	455	467	6	173	26	455	467	199	205
Output ($ in millions)	$71	$72	$1.0	$27	$4.4	$71	$72	$31	$32
Value Added ($ in millions)	$67	$68	$0.9	$25	$3.8	$67	$68	$29	$30
Earnings ($ in millions)	$45	$46	$0.6	$17	$2.7	$45	$46	$20	$20

LANL = Los Alamos National Laboratory; MFFF = Mixed Oxide Fuel Fabrication Facility; PDC = Pit Disassembly and Conversion Project; PDCF = Pit Disassembly and Conversion Facility; PF-4 = Plutonium Facility; SRS = Savannah River Site.

[a] Modifications at the K-Area Complex to support pit disassembly for subsequent conversion at H-Canyon/HB-Line or elsewhere is not expected to require additional employment; existing maintenance and construction staff would be used for the modifications.

[b] These impacts reflect modifications to provide the capability for a total plutonium throughput at PF-4 of 35 metric tons (38.6 tons).

Table F–9 Peak Annual Socioeconomic Impacts Associated with Operation of Pit Disassembly and Conversion Options

	Facilities						*Pit Disassembly and Conversion Options*			
	SRS				*LANL*					
Resource	*PDCF*	*PDC*	*H-Canyon/ HB-Line* [a]	*MFFF*	*PF-4 (2 MT)*	*PF-4 (35 MT)*	*PDCF*	*PDC*	*PF-4 and MFFF*	*PF-4, H-Canyon/ HB-Line, and MFFF*
Direct Employment	550	500	140	35	149	493	699	649	528	668
Indirect Employment	654	595	167	42	151	499	805	746	541	708
Output ($ in millions)	$98	$89	$25	$6.2	$19	$64	$117	$108	$70	$95
Value Added ($ in millions)	$83	$75	$21	$5.3	$19	$63	$102	$94	$68	$89
Earnings ($ in millions)	$48	$44	$12	$3.1	$14	$48	$62	$58	$51	$63

LANL = Los Alamos National Laboratory; MFFF = Mixed Oxide Fuel Fabrication Facility; MT = metric tons; PDC = Pit Disassembly and Conversion Project; PDCF = Pit Disassembly and Conversion Facility; PF-4 = Plutonium Facility; SRS = Savannah River Site.

[a] This column provides the combined impacts for pit disassembly at the K-Area Complex and conversion to plutonium oxide at H-Canyon/ HB-Line.

Note: To convert metric tons to tons, multiply by 1.1023.

F.3.1 PDCF at F-Area at SRS

Construction—At SRS, direct employment during construction of PDCF is expected to peak at 722 workers. The direct construction employment would generate an estimated 455 indirect jobs in the ROI. The direct economic output during the peak year of construction is estimated to be approximately $71 million. Approximately $67 million of the direct economic output would be value added to the local economy in the form of final goods and services directly comparable to Gross Domestic Product (GDP). Approximately $45 million of the value added would be in the form of direct earnings of construction workers. At LANL, no construction would be required at PF-4 to support pit disassembly and conversion of 2 metric tons (2.2 tons) of plutonium.

Operations—At SRS, direct employment at PDCF is expected to peak at 550 workers. The direct employment would generate an estimated 654 indirect jobs in the ROI. The direct economic output during the peak year of operations is estimated to be $98 million, of which $83 million is estimated to be value added to the local economy in the form of final goods and services directly comparable to GDP. Approximately $48 million of the value added would be in the form of direct earnings of those employed at PDCF.

At LANL, direct employment at PF-4 to support pit disassembly and conversion of 2 metric tons (2.2 tons) of plutonium would peak at 149 workers. The direct employment would generate an estimated 151 indirect jobs in the ROI. The direct economic output during operations of PF-4 at LANL is estimated to be $19 million. The value added to the local economy in the form of final goods and services directly comparable to GDP is estimated to be approximately $19 million. Approximately $14 million of the value added would be in the form of direct earnings of workers at PF-4.

F.3.2 PDC at K-Area at SRS

Construction—At SRS, direct employment during construction of PDC is expected to peak at 741 workers. The direct construction employment would generate an estimated 467 indirect jobs in the ROI. The direct economic output during the peak year of construction is estimated to be approximately $72 million. Approximately $68 million of the direct economic output would be value added to the local economy in the form of final goods and services directly comparable to GDP. Approximately $46 million of the value added would be in the form of direct earnings of construction workers. At LANL, as under the PDCF Option (see Section F.3.1), no construction would be required at PF-4 to support pit disassembly and conversion of 2 metric tons (2.2 tons) of plutonium.

Operations—At SRS, direct employment at PDC is expected to peak at 500 workers. The direct employment would generate an estimated 595 indirect jobs in the ROI. The direct economic output during the peak year of operations is estimated to be $89 million, of which $75 million is estimated to be value added to the local economy in the form of final goods and services directly comparable to GDP. Approximately $44 million of the value added would be in the form of direct earnings of those employed at PDC. At LANL, impacts during the peak year of operation of PF-4 would be the same as those in Section F.3.1 under the PDCF Option.

F.3.3 PF-4 at LANL and MFFF at SRS

Construction—At SRS, direct employment during installation of metal oxide furnaces in MFFF to provide a pit conversion capability would be expected to peak at 275 workers. The direct construction employment would generate an estimated 173 indirect jobs in the SRS ROI. The direct economic output during the peak year of construction is estimated to be approximately $27 million. Approximately $25 million of the direct output would be value added to the local economy in the form of final goods and services directly comparable to GDP. Approximately $17 million of the value added would be in the form of direct earnings to construction workers.

At LANL, direct employment during modifications at PF-4 to support disassembly and conversion of 35 metric tons (38.6 tons) of pit plutonium would be expected to peak at 46 workers. The direct employment during modifications would generate an estimated 26 indirect jobs within the LANL ROI. The direct economic output during the peak year of modification activities is estimated to be approximately $4.4 million. Approximately $3.8 million of the direct economic output would be value added to the local economy in the form of final goods and services directly comparable to GDP. Approximately $2.7 million of the value added would be in the form of direct earnings of construction workers.

Operations— At SRS, direct employment due to operation of the metal oxidation furnaces at MFFF is expected to require 35 workers. The direct employment would generate an estimated 42 indirect jobs in the SRS ROI. The direct economic output during operation of the metal oxidation furnaces at MFFF is estimated to be approximately $6.2 million, of which $5.3 million is estimated to be value added to the local economy in the form of final goods and services directly comparable to GDP. Approximately $3.1 million of the value added would be in the form of direct earnings of MFFF employees engaged in operation of the metal oxidation furnaces. The direct employment required for MFFF operations under this option would be drawn from the existing SRS workforce and is not expected to result in additional employment.

At LANL, direct employment at PF-4 is expected to increase to 493 workers during peak operations. The direct employment would generate an estimated 499 indirect jobs in the ROI. The direct economic output attributable to pit disassembly and conversion activities at PF-4 is estimated to be $64 million, of which $62 million is estimated to be value added to the local economy in the form of final goods and services directly comparable to GDP. Approximately $48 million of the value added would be in the form of direct earnings of PF-4 workers.

F.3.4 PF-4 at LANL and H-Canyon/HB-Line and MFFF at SRS

Construction—At SRS, the socioeconomic impacts from installation of metal oxide furnaces in MFFF to provide a pit conversion capability would be the same as those in Section F.3.3 under the PF-4 and MFFF Option.

Modifications to the K-Area Complex to enable pit disassembly would not be expected to require any additional employment.

Modifications to H-Canyon/HB-Line to support pit conversion would require an estimated 10 direct workers. The direct employment is expected to generate approximately 6 indirect workers. The direct economic output attributable to H-Canyon/HB-Line modifications would be approximately $1.0 million, of which $0.9 million would be value added to the local economy in the form of final goods and services directly comparable to GDP. Approximately $0.6 million would be in the form of direct earnings to workers. The direct employment required for H-Canyon/HB-Line modifications under this option would be drawn from the existing SRS workforce and is not expected to result in additional employment.

At LANL, facility modification activities at PF-4 would be the same as those in Section F.3.3 under the PF-4 and MFFF Option.

Operations—At SRS, operation of a pit disassembly glovebox at the K-Area Complex is expected to require direct employment of 40 workers. Pit conversion activities at H-Canyon/HB-Line would require direct employment of 100 workers. The combined direct employment of 140 workers at the K-Area Complex and H-Canyon/HB-Line would generate approximately 167 indirect jobs in the SRS ROI. The direct economic output attributable to the K-Area Complex and H-Canyon/HB-Line operations is estimated to be approximately $25 million, of which approximately $21 million would be value added to the local economy in the form of final goods and services directly comparable to GDP. Approximately $12 million of the value added would be in the form of earnings of K-Area Complex and H-Canyon/HB-Line workers.

The socioeconomic impacts from operation of the metal oxidation furnaces at MFFF would be the same as those in Section F.3.3 under the PF-4 and MFFF Option.

At LANL, the socioeconomic impacts during the peak year of operations of PF-4 would be the same as those in Section F.3.3 under the PF-4 and MFFF Option.

F.4 Waste Management

This section analyzes impacts of pit disassembly and conversion options on waste management facilities. The waste types addressed include contact-handled transuranic (CH-TRU) and mixed CH-TRU waste (analyzed collectively), solid low-level radioactive waste (LLW), solid mixed low-level radioactive waste (MLLW), solid hazardous waste, solid nonhazardous waste, liquid LLW, and liquid nonhazardous waste. The generation of these waste streams is the result of construction, modifications, and operations associated with the facilities being analyzed for pit disassembly and conversion. Years of operation would vary depending on the combination of pit disassembly and conversion and pit disposition options that might be implemented under the *SPD Supplemental EIS* alternatives.

Waste management facilities are described in Chapter 3, Sections 3.1.10 and 3.2.10. Waste management impacts are evaluated as a percentage of treatment, storage, or disposal capacity, depending on a particular waste type's onsite disposition. For LANL, if a waste type is shipped off site for disposal, its impacts are evaluated as a percentage increase in projected quantities that would be generated as a result of an *SPD Supplemental EIS* alternative over existing waste generation rates as reported for 2009. These capacities or current generation rates are discussed in detail in Chapter 3 and are summarized in **Table F–10** and **F–11** for SRS and LANL, respectively.

F.4.1 PDCF at F-Area at SRS

Construction—**Table F–12** summarizes the average annual amount of waste that would be generated at SRS from construction of PDCF under this option. Construction of PDCF would generate solid hazardous waste, solid nonhazardous waste, and liquid nonhazardous waste. **Table F–13** summarizes the total amount of waste that would be generated under this option. At LANL, there would be no construction or facility modification activities at PF-4 that would generate any waste types above what is currently generated.

Table F–10 Summary of Waste Management Capacities at the Savannah River Site

Waste Type	*Annual Capacity*	*Disposition Method*	*Impact Criteria*
Transuranic	13,200 cubic meters	Onsite storage pads	As a percent of storage capacity
Solid LLW	37,000 cubic meters [a]	Onsite disposal slits or engineered trenches	As a percent of disposal capacity
Solid MLLW	296 cubic meters [b]	Onsite storage pads	As a percent of storage capacity
Solid hazardous	296 cubic meters [b]	Onsite storage pads	As a percent of storage capacity
Solid nonhazardous	4,200,000 cubic meters per year	Regional municipal landfill disposal	As a percent of permitted disposal capacity
Liquid LLW	590,000,000 liters	Onsite F/H Effluent Treatment Project	As a percent of treatment capacity
Liquid nonhazardous	1,500,000,000 liters	Onsite Central Sanitary Wastewater Treatment Facility	As a percent of treatment capacity

LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste.
[a] As of February 2012, the estimated unused disposal capacity remaining is approximately 23,000 cubic meters for the slit trenches and 14,000 cubic meters for the engineered trenches.
[b] Pad 26-E is permitted to store a maximum of 296 cubic meters in aggregate for solid MLLW and solid hazardous waste.
Note: To convert cubic meters to cubic feet, multiply by 35.314; liters to gallons, multiply by 0.26418.
Source: Chapter 3, Section 3.1.10.

Table F–11 Summary of Waste Management Capacities at Los Alamos National Laboratory

Waste Type	*Annual Capacity or Generation Rate*	*Disposition Method*	*Impact Criteria* [a]
Transuranic [b]	17,000 drum equivalents (3,400 cubic meters) [c]	Onsite storage pads	As a percent of storage capacity
Solid LLW	3,772 cubic meters	Onsite disposal or offsite disposal at Federal or commercial facilities	As a percent increase of existing generation rates
Solid MLLW	13.5 cubic meters	Offsite commercial disposal	As a percent increase of existing generation rates
Solid hazardous	1,723 metric tons	Offsite commercial disposal	As a percent increase of existing generation rates
Solid nonhazardous	2,562 metric tons	Offsite commercial landfill disposal	As a percent increase of existing generation rates
Liquid LLW	4,000,000 liters	Onsite Radioactive Liquid Waste Treatment Facility	As a percent of treatment capacity
Liquid nonhazardous	840,000,000 liters	Onsite Sanitary Wastewater System	As a percent of treatment capacity

LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; drum equivalent = one 55-gallon drum.
[a] Impact criteria for solid LLW, solid MLLW, solid hazardous waste, and solid nonhazardous waste are calculated as a percent increase over generation rates reported in 2009; impact criteria for other wastes are calculated as a percent of onsite storage or treatment capacity.
[b] The listed volume is based on current safety basis analyses (see Chapter 3, Section 3.2.10.2).
[c] One 55-gallon drum contains approximately 0.2 cubic meters of waste.
Note: To convert cubic meters to cubic feet, multiply by 35.314; liters to gallons, multiply by 0.26418.
Source: Chapter 3, Section 3.2.10.

Table F–12 Average Annual Construction Waste Generation from PDCF at SRS

Facility	*CH-TRU Waste (m^3/yr)*	*Solid LLW (m^3/yr)*	*Solid MLLW (m^3/yr)*	*Solid HW (m^3/yr)*	*Solid Non-HW (m^3/yr)*	*Liquid LLW (liters/yr)*	*Liquid Non-HW (liters/yr)*
PDCF	negligible	negligible	negligible	5.6	130	negligible	1,500,000
Percent of SRS Capacity	*negligible*	*negligible*	*negligible*	*1.9*	*<0.1*	*negligible*	*0.1*

CH-TRU = contact-handled transuranic; HW = hazardous waste; LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; m^3 = cubic meters; PDCF = Pit Disassembly and Conversion Facility; SRS = Savannah River Site; yr = year.
Note: To convert cubic meters to cubic feet, multiply by 35.314; liters to gallons, multiply by 0.26418.
Source: DOE/NNSA 2012.

Table F–13 Total Construction Waste Generation from PDCF at SRS

Facility	*CH-TRU Waste (m^3)*	*Solid LLW (m^3)*	*Solid MLLW (m^3)*	*Solid HW (m^3)*	*Solid Non-HW (m^3)*	*Liquid LLW (liters)*	*Liquid Non-HW (liters)*
PDCF	negligible	negligible	negligible	56	1,300	negligible	15,000,000

CH-TRU = contact-handled transuranic; HW = hazardous waste; LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; m^3 = cubic meters; PDCF = Pit Disassembly and Conversion Facility.
Note: To convert cubic meters to cubic feet, multiply by 35.314; liters to gallons, multiply by 0.26418.
Source: DOE/NNSA 2012.

Operations—**Table F–14** summarizes the peak annual amount of waste that would be generated from pit disassembly and conversion activities at SRS and LANL under this option. Operation of PDCF and PF-4 would generate CH-TRU waste, solid LLW, solid MLLW, solid hazardous waste, solid nonhazardous waste, liquid LLW, and liquid nonhazardous waste. Table F–14 does not include liquid waste that would be sent from PDCF to the Waste Solidification Building (WSB) for further processing; waste generated from WSB operations is addressed in Appendix H.

Table F–14 Peak Annual Operations Waste Generation from PDCF at SRS and PF-4 at LANL

Facility	*CH-TRU Waste (m^3/yr)*	*Solid LLW (m^3/yr)*	*Solid MLLW (m^3/yr)*	*Solid HW (m^3/yr)*	*Solid Non-HW (m^3/yr)*	*Liquid LLW (liters/yr)*	*Liquid Non-HW (liters/yr)*
PDCF	180	970	negligible	0.1	2,000	91,000	31,000,000
Percent of SRS Capacity	*1.4*	*2.6*	*negligible*	*<0.1*	*<0.1*	*<0.1*	*2.1*
PF-4	18	29	0.3	negligible	negligible	570	negligible
Percent of LANL Capacity [a]	*0.5*	*0.8*	*2.2*	*negligible*	*negligible*	*<0.1*	*negligible*

CH-TRU = contact-handled transuranic; HW = hazardous waste; LANL = Los Alamos National Laboratory; LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; m^3 = cubic meters; PDCF = Pit Disassembly and Conversion Facility; PF-4 = Plutonium Facility; SRS = Savannah River Site; yr = year.

[a] Impact criteria for solid LLW, solid MLLW, solid hazardous waste, and solid nonhazardous waste are calculated as a percent increase over generation rates reported in 2009; impact criteria for other wastes are calculated as a percent of onsite storage or treatment capacity.

Note: To convert cubic meters to cubic feet, multiply by 35.314; liters to gallons, multiply by 0.26418.

Source: DOE/NNSA 2012; LANL 2013.

F.4.2 PDC at K-Area at SRS

Construction—**Table F–15** summarizes the average annual amount of waste that would be generated at SRS from construction of PDC under this option. Construction of PDC would generate solid LLW, solid MLLW, solid hazardous waste, and solid nonhazardous waste. Equipment and piping would be installed and structural changes would be made to existing K-Area facilities. The removal of equipment and piping would increase the generation of radioactive and nonradioactive polychlorinated biphenyl-contaminated waste, which would be managed as solid MLLW and solid hazardous waste (WSRC 2008a, 2008b:7). At LANL, there would be no construction or facility modification activities required at PF-4 that would generate any waste types above what is currently generated. **Table F–16** summarizes the total amount of waste that would be generated.

Together, the average annual generation of solid MLLW and solid hazardous waste would occupy about 290 percent of the available onsite storage capacity at SRS, assuming this waste was not transported offsite for disposition. However, these wastes are routinely transported offsite to a treatment, storage, or disposal facility. To mitigate these impacts, shipments could be scheduled to occur more frequently or the available storage capacity could be increased, if adequate shipments could not be scheduled to accommodate the annual generation of this waste.

Table F–15 Average Annual Construction Waste Generation from PDC at SRS

Facility	*CH-TRU Waste (m^3/yr)*	*Solid LLW (m^3/yr)*	*Solid MLLW (m^3/yr)*	*Solid HW (m^3/yr)*	*Solid Non-HW (m^3/yr)*	*Liquid LLW (liters/yr)*	*Liquid Non-HW (liters/yr)*
PDC	negligible	1,300	19	820	860	negligible	negligible
Percent of SRS Capacity	*negligible*	*3.5*	*6.4*	*280*	*<0.1*	*negligible*	*negligible*

CH-TRU = contact-handled transuranic; HW = hazardous waste; LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; m^3 = cubic meters; PDC = Pit Disassembly and Conversion Project; SRS = Savannah River Site; yr = year.

Note: To convert cubic meters to cubic feet, multiply by 35.314; liters to gallons, multiply by 0.26418.

Source: DOE/NNSA 2012.

Table F–16 Total Construction Waste Generation from PDC at SRS

Facility	*CH-TRU Waste (m^3)*	*Solid LLW (m^3)*	*Solid MLLW (m^3)*	*Solid HW (m^3)*	*Solid Non-HW (m^3)*	*Liquid LLW (liters)*	*Liquid Non-HW (liters)*
PDC	negligible	12,000	210	7,000	6,800	negligible	negligible

CH-TRU = contact-handled transuranic; HW = hazardous waste; LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; m^3 = cubic meters; PDC = Pit Disassembly and Conversion Project; SRS = Savannah River Site.
Note: To convert cubic meters to cubic feet, multiply by 35.314; liters to gallons, multiply by 0.26418.
Source: DOE/NNSA 2012.

Operations—**Table F–17** summarizes the peak annual amount of waste that would be generated from pit disassembly and conversion activities at SRS and LANL under this option. Operation of PDC and PF-4 would generate CH-TRU waste, solid LLW, solid MLLW, solid hazardous waste, solid nonhazardous waste, liquid LLW, and liquid nonhazardous waste. Not shown in Table F–17 is liquid waste that would be sent from PDC to the WSB for further processing; waste generated from WSB operations is addressed in Appendix H.

Table F–17 Peak Annual Operations Waste Generation from PDC at SRS and PF-4 at LANL

Facility	*CH-TRU Waste (m^3/yr)*	*Solid LLW (m^3/yr)*	*Solid MLLW (m^3/yr)*	*Solid HW (m^3/yr)*	*Solid Non-HW (m^3/yr)*	*Liquid LLW (liters/yr)*	*Liquid Non-HW (liters/yr)*
PDC	180	970	negligible	0.1	2,000	28,000	31,000,000
Percent of SRS Capacity	*1.4*	*2.6*	*negligible*	*<0.1*	*<0.1*	*<0.1*	*2.1*
PF-4	18	29	0.3	negligible	negligible	570	negligible
Percent of LANL Capacity [a]	*0.5*	*0.8*	*2.2*	*negligible*	*negligible*	*<0.1*	*negligible*

CH-TRU = contact-handled transuranic; HW = hazardous waste; LANL = Los Alamos National Laboratory; LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; m^3 = cubic meters; PDC = Pit Disassembly and Conversion Project; PF-4 = Plutonium Facility; SRS = Savannah River Site; yr = year.
[a] Impact criteria for solid LLW, solid MLLW, solid hazardous waste, and solid nonhazardous waste are calculated as a percent increase over generation rates reported in 2009; impact criteria for other wastes are calculated as a percent of onsite storage or treatment capacity.
Note: To convert cubic meters to cubic feet, multiply by 35.314; liters to gallons, multiply by 0.26418.
Source: DOE/NNSA 2012; LANL 2013.

F.4.3 PF-4 at LANL and MFFF at SRS

Construction—**Table F–18** summarizes the average annual amount of waste that would be generated from facility modification activities at SRS and LANL under this option. At SRS, metal oxidation furnaces would be installed in MFFF during its construction or operation to provide a pit conversion capability; however, negligible amounts of wastes in addition to those anticipated for construction of MFFF would be generated. At LANL, modification of PF-4 would generate CH-TRU waste, solid LLW, and solid MLLW. Modification of PF-4 could result in a 52 percent increase in the annual amount of LANL-generated solid MLLW as reported in 2009; this is not expected to have significant impacts on the offsite commercial disposal of this waste stream. **Table F–19** summarizes the total amount of waste that would be generated.

Table F–18 Average Annual Construction Waste Generation from MFFF at SRS and PF-4 at LANL

Facility	CH-TRU Waste (m^3/yr)	Solid LLW (m^3/yr)	Solid MLLW (m^3/yr)	Solid HW (m^3/yr)	Solid Non-HW (m^3/yr)	Liquid LLW (liters/yr)	Liquid Non-HW (liters/yr)
Metal oxidation furnaces at MFFF	0	negligible	negligible	negligible	negligible	negligible	negligible
Percent of SRS Capacity	*N/A*	*negligible*	*negligible*	*negligible*	*negligible*	*negligible*	*negligible*
PF-4	2.4	4.6	7.0	negligible	negligible	negligible	negligible
Percent of LANL Capacity [a]	*<0.1*	*0.1*	*52*	*negligible*	*negligible*	*negligible*	*negligible*

CH-TRU = contact-handled transuranic; HW = hazardous waste; LANL = Los Alamos National Laboratory; LLW = low-level radioactive waste; MFFF = Mixed Oxide Fuel Fabrication Facility; MLLW = mixed low-level radioactive waste; m^3 = cubic meters; N/A = not applicable; PF-4 = Plutonium Facility; SRS = Savannah River Site; yr = year.

[a] Impact criteria for solid LLW, solid MLLW, solid hazardous waste, and solid nonhazardous waste are calculated as a percent increase over generation rates reported in 2009; impact criteria for other wastes are calculated as a percent of onsite storage or treatment capacity.

Note: To convert cubic meters to cubic feet, multiply by 35.314; liters to gallons, multiply by 0.26418.

Source: LANL 2013; SRNS 2012.

Table F–19 Total Construction Waste Generation from MFFF at SRS and PF-4 at LANL

Facility	CH-TRU Waste (m^3)	Solid LLW (m^3)	Solid MLLW (m^3)	Solid HW (m^3)	Solid Non-HW (m^3)	Liquid LLW (liters)	Liquid Non-HW (liters)
Metal oxidation furnaces at MFFF	0	negligible	negligible	negligible	negligible	negligible	negligible
PF-4	19	37	56	negligible	negligible	negligible	negligible

CH-TRU = contact-handled transuranic; HW = hazardous waste; LANL = Los Alamos National Laboratory; LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; MFFF = Mixed Oxide Fuel Fabrication Facility; m^3 = cubic meters; PF-4 = Plutonium Facility; SRS = Savannah River Site.

Note: To convert cubic meters to cubic feet, multiply by 35.314; liters to gallons, multiply by 0.26418.

Source: LANL 2013; SRNS 2012.

Operations—**Table F–20** summarizes the peak annual amount of waste that would be generated from pit disassembly and conversion activities under this option. Operation of metal oxidation furnaces at MFFF would generate CH-TRU waste and solid LLW. Operation of PF-4 at LANL would generate CH-TRU waste, solid LLW, solid MLLW, solid hazardous waste, and liquid LLW.

Table F–20 Peak Annual Operations Waste Generation from MFFF at SRS and PF-4 at LANL

Facility	CH-TRU Waste (m^3/yr)	Solid LLW (m^3/yr)	Solid MLLW (m^3/yr)	Solid HW (m^3/yr)	Solid Non-HW (m^3/yr)	Liquid LLW (liters/yr)	Liquid Non-HW (liters/yr)
Metal oxidation furnaces at MFFF	9.2	16	negligible	negligible	negligible	negligible	negligible
Percent of SRS Capacity	*<0.1*	*<0.1*	*negligible*	*negligible*	*negligible*	*negligible*	*negligible*
PF-4	170	180	1.4	0.2	negligible	3,200	negligible
Percent of LANL Capacity [a]	*5.0*	*4.8*	*10*	*<0.1*	*negligible*	*<0.1*	*negligible*

CH-TRU = contact-handled transuranic; HW = hazardous waste; LANL = Los Alamos National Laboratory; LLW = low-level radioactive waste; MFFF = Mixed Oxide Fuel Fabrication Facility; MLLW = mixed low-level radioactive waste; m^3 = cubic meters; PF-4 = Plutonium Facility; SRS = Savannah River Site; yr = year.

[a] Impact criteria for solid LLW, solid MLLW, solid hazardous waste, and solid nonhazardous waste are calculated as a percent increase over generation rates reported in 2009; impact criteria for other wastes are calculated as a percent of onsite storage or treatment capacity.

Note: To convert cubic meters to cubic feet, multiply by 35.314; liters to gallons, multiply by 0.26418.

Source: LANL 2013; SRNS 2012.

F.4.4 PF-4 at LANL and H-Canyon/HB-Line and MFFF at SRS

Construction—**Table F–21** summarizes the average annual amount of waste that would be generated from facility modifications under this option. Modification of SRS and LANL facilities would generate CH-TRU waste, solid LLW, and solid MLLW. At SRS, minor quantities of wastes would result from modifications to the K-Area Complex to enable pit disassembly, and from modifications to H-Canyon/HB-Line to enhance the facility's pit conversion capability. In addition, metal oxidation furnaces would be installed in MFFF to provide a pit conversion capability, although negligible amounts of wastes in addition to those anticipated for construction of MFFF would be generated. At LANL, modification of PF-4 could result in a 52 percent increase in the annual amount of LANL-generated solid MLLW as reported in 2009; this is not expected to have significant impacts on the offsite commercial disposal of this waste stream. **Table F–22** summarizes the total amount of waste that would be generated.

Table F–21 Average Annual Construction Waste Generation from the K-Area Complex, H-Canyon/HB-Line, and MFFF at SRS, and PF-4 at LANL

Facility	*CH-TRU Waste (m^3/yr)*	*Solid LLW (m^3/yr)*	*Solid MLLW (m^3/yr)*	*Solid HW (m^3/yr)*	*Solid Non-HW (m^3/yr)*	*Liquid LLW (liters/yr)*	*Liquid Non-HW (liters/yr)*
Pit disassembly at the K-Area Complex	1.5	2.5	negligible	negligible	negligible	negligible	negligible
H-Canyon/HB-Line	10	18	negligible	negligible	negligible	negligible	negligible
Metal oxidation furnaces at MFFF	0	negligible	negligible	negligible	negligible	negligible	negligible
Percent of SRS Capacity	*<0.1*	*<0.1*	*negligible*	*negligible*	*negligible*	*negligible*	*negligible*
PF-4	2.4	4.6	7.0	negligible	negligible	negligible	negligible
Percent of LANL Capacity [a]	*<0.1*	*0.1*	*52*	*negligible*	*negligible*	*negligible*	*negligible*

CH-TRU = contact-handled transuranic; HW = hazardous waste; LANL = Los Alamos National Laboratory; LLW = low-level radioactive waste; MFFF = Mixed Oxide Fuel Fabrication Facility; MLLW = mixed low-level radioactive waste; m^3 = cubic meters; PF-4 = Plutonium Facility; SRS = Savannah River Site; yr = year.

[a] Impact criteria for solid LLW, solid MLLW, solid hazardous waste, and solid nonhazardous waste are calculated as a percent increase over generation rates reported in 2009; impact criteria for other wastes are calculated as a percent of onsite storage or treatment capacity.

Note: To convert cubic meters to cubic feet, multiply by 35.314; liters to gallons, multiply by 0.26418.

Source: LANL 2013; SRNL 2013; SRNS 2012.

Table F–22 Total Construction Waste Generation from the K-Area Complex, H-Canyon/HB-Line, and MFFF at SRS, and PF-4 at LANL

Facility	*CH-TRU Waste (m^3)*	*Solid LLW (m^3)*	*Solid MLLW (m^3)*	*Solid HW (m^3)*	*Solid Non-HW (m^3)*	*Liquid LLW (liters)*	*Liquid Non-HW (liters)*
Pit disassembly at the K-Area Complex	3	5	negligible	negligible	negligible	negligible	negligible
H-Canyon/HB-Line	20	36	negligible	negligible	negligible	negligible	negligible
Metal oxidation furnaces at MFFF	0	negligible	negligible	negligible	negligible	negligible	negligible
PF-4	19	37	56	negligible	negligible	negligible	negligible

CH-TRU = contact-handled transuranic; HW = hazardous waste; LANL = Los Alamos National Laboratory; LLW = low-level radioactive waste; MFFF = Mixed Oxide Fuel Fabrication Facility; MLLW = mixed low-level radioactive waste; m^3 = cubic meters; PF-4 = Plutonium Facility; SRS = Savannah River Site.

Note: To convert cubic meters to cubic feet, multiply by 35.314; liters to gallons, multiply by 0.26418.

Source: LANL 2013; SRNL 2013; SRNS 2012.

Operations—**Table F–23** summarizes the peak annual amount of waste that would be generated from operations under this option. Operations at the listed facilities would generate CH-TRU waste, solid LLW, solid MLLW, solid hazardous waste, solid nonhazardous waste, and liquid LLW.

Table F–23 Peak Annual Operations Waste Generation from the K-Area Complex, H-Canyon/HB-Line, and MFFF at SRS, and PF-4 at LANL

Facility	CH-TRU Waste (m^3/yr)	Solid LLW (m^3/yr)	Solid MLLW (m^3/yr)	Solid HW (m^3/yr)	Solid Non-HW (m^3/yr)	Liquid LLW (liters/yr)	Liquid Non-HW (liters/yr)
Pit disassembly at the K-Area Complex	20	80	negligible	negligible	negligible	negligible	negligible
H-Canyon/ HB-Line	22	130	negligible	negligible	negligible	negligible	negligible
Metal oxidation furnaces at MFFF	9.2	16	negligible	negligible	negligible	negligible	negligible
Percent of SRS Capacity	*<0.1*	*0.6*	*negligible*	*negligible*	*negligible*	*negligible*	*negligible*
PF-4	170	180	1.4	0.2	negligible	3,200	negligible
Percent of LANL Capacity [a]	*5.0*	*4.8*	*10*	*<0.1*	*negligible*	*<0.1*	*negligible*

CH-TRU = contact-handled transuranic; HW = hazardous waste; LANL = Los Alamos National Laboratory; LLW = low-level radioactive waste; MFFF = Mixed Oxide Fuel Fabrication Facility; MLLW = mixed low-level radioactive waste; m^3 = cubic meters; PF-4 = Plutonium Facility; SRS = Savannah River Site; yr = year.

[a] Impact criteria for solid LLW, solid MLLW, solid hazardous waste, and solid nonhazardous waste are calculated as a percent increase over generation rates reported in 2009; impact criteria for other wastes are calculated as a percent of onsite storage or treatment capacity.

Note: To convert cubic meters to cubic feet, multiply by 35.314; liters to gallons, multiply by 0.26418.

Source: LANL 2013; SRNL 2013; SRNS 2012.

F.5 Transportation

Transportation involves the movement of materials between facilities involved in the Surplus Plutonium Disposition program including pit disassembly and conversion facilities, plutonium disposition facilities, support facilities, and domestic commercial nuclear power reactors, as well as waste to treatment, storage, and disposal facilities. This type of system-wide analysis does not lend itself to analysis of a portion of the system (e.g., just pit disassembly and conversion) when evaluating impacts from transportation of materials and wastes. See Appendix E, "Evaluation of Human Health Effects from Transportation," for a detailed description of the transportation impacts associated with the alternatives being evaluated in this *SPD Supplemental EIS*, including impacts associated with the pit disassembly and conversion options. Appendix E, Section E.11, provides a discussion of the impacts associated with onsite shipments at SRS and LANL.

F.6 Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs Federal agencies to identify and address, as appropriate, disproportionately high and adverse human health and environmental effects of their programs, policies, and activities on minority and low-income populations. The alternatives considered in this *SPD Supplemental EIS* involve construction and operation of several facilities in various combinations, with different levels of efforts and operational timeframes. This type of system-wide analysis does not lend itself to analysis of a portion of the system (e.g., just pit disassembly and conversion). Chapter 4, Section 4.1.6, presents the potential impacts on populations surrounding the facilities at SRS and LANL that would be involved in surplus plutonium activities under the *SPD Supplemental EIS* alternatives. Included are the impacts associated with pit disassembly and conversion facilities.

F.7 Other Resource Areas

F.7.1 Land Resources

This section describes impacts on land resources from construction and operations of pit disassembly and conversion options. Land resources include land use and visual resources. Only construction of PDCF or PDC at SRS, or enhancement of the existing pit disassembly and conversion capability in PF-4 at LANL, has the potential to affect land resources. No impacts on land resources are expected at SRS for pit disassembly at the K-Area Complex or for plutonium conversion using H-Canyon/HB-Line or metal oxidation furnaces installed at MFFF. Similarly, no impacts on land resources are expected at LANL for pit disassembly and conversion at PF-4 under any pit disassembly and conversion option.

F.7.1.1 PDCF at F-Area at SRS

Construction—This section only addresses construction of facilities at SRS. There would be no new construction at LANL that would impact land use or visual resources.

Land use. PDCF would be located within F-Area in the same general area as that originally analyzed in the *SPD EIS* (DOE 1999). The area required to construct this facility, which has been cleared in expectation of construction, would be about 50 acres (20 hectares), including a laydown area. Once completed, PDCF would encompass less than 23 acres (9.3 hectares). It was assumed for the *SPD EIS* that three facilities (i.e., immobilization, PDCF, and MFFF) would be built within the same location and require a total of 79 acres (32 hectares) for construction (DOE 1999:2-49, 4-287). However, MFFF was subsequently moved to an 87-acre (35-hectare) site situated to the northwest of its original location (NRC 2005:1-8; SRNS 2012), and is currently under construction. WSB is currently under construction on a 15-acre (6.1-hectare) site at F-Area (SRNS 2012). Because the use of land for construction of PDCF would be consistent with the present heavy industrial nature of F-Area and would be consistent with the goals of the Industrial Core (see Chapter 3, Section 3.1.1.1), there would be minimal impacts on existing land use.

Visual resources. PDCF would be built within F-Area with construction occurring within a cleared area immediately adjacent to existing industrial facilities. Thus, the appearance of new facilities would be consistent with the industrialized character of the area. Also, the Visual Resource Management (VRM) Class IV designation applicable to F-Area would not change.

Operations—There would be no impacts on land use or visual resources from operation of PDCF at SRS or PF-4 at LANL.

F.7.1.2 PDC at K-Area at SRS

Construction—This section only addresses construction of facilities at SRS. There would be no new construction at LANL that would impact land use or visual resources.

Land use. Construction of PDC would take place within K-Area. In total, construction would require about 30 acres (12 hectares) of land of which 25 acres (10 hectares) are presently disturbed by existing facilities or are cleared. The remaining 5 acres (2 hectares) needed for construction is wooded. This area could be cleared for a warehouse and/or parking (SRNS 2012). The total project footprint following construction would be about 18 acres (7.3 hectares). The impacts of clearing 210 acres (85 hectares) in K-Area, including the 5 acres (2 hectares) proposed under this option, were addressed in the *Environmental Assessment for the Safeguards and Security Upgrades for Storage of Plutonium Materials at the Savannah River Site* (DOE 2005d). That assessment resulted in a Finding of No Significant Impact (DOE 2005e). An additional activity planned under this option is construction of a 2-mile (3.2-kilometer) sanitary tie-in connecting K-Area to a lift station at C-Area. Although the exact route is undetermined at this time, it would likely use existing easements; thus, it is not expected to alter current land use. This would be verified prior to construction through the SRS site use review process (Reddick 2010).

Visual resources. As noted above, construction of PDC would take place at K-Area. With the exception of a new parking lot, construction would take place within the developed portion of K-Area and would be compatible with its industrial appearance. The new parking lot would remove 5 acres (2 hectares) of woodland located on the east side of the complex. However, this acreage is part of the 210 acres (85 hectares) of woodland to be removed as part of the safeguards and security measures to be implemented at K-Area. The removal of this acreage was evaluated under the *Environmental Assessment for the Safeguards and Security Upgrades for Storage of Plutonium Materials at the Savannah River Site* (DOE 2005d) for which a Finding of No Significant Impact was issued (DOE 2005e).

Operations—There would be no impacts on land use or visual resources from operation of PDC at SRS or PF-4 at LANL.

F.7.1.3 PF-4 at LANL and MFFF at SRS

*Construction—Land use. A*t SRS, modification of capabilities in MFFF to support plutonium conversion using metal oxidation furnaces would be internal to the structure. Because installation of the metal oxidation furnaces in MFFF would require no additional ground disturbance there would be no impacts on land use at SRS. At LANL modifications to PF-4 to support an enhanced pit disassembly and conversion capability would occur within the existing building. However, to support these modifications, less than 2 acres (0.8 hectares) would be needed for a temporary trailer and construction parking. While a site has not been identified, preference would be given to previously-disturbed land and appropriate site permits would be acquired through the Permit Requirements Identification process to ensure that no cultural or natural resources would be impacted (LANL 2013).

Visual resources. At SRS, because modifications of capabilities in MFFF to support plutonium conversion using metal oxidation furnaces would be internal to the structure, there would be no additional visual impacts associated with this activity. At LANL, visual impacts would be minimal because most activities associated with PF-4 modifications would take place within the existing structure. While a temporary trailer and construction parking lot could disturb less than 2 acres (0.8 hectares), this would have minimal impacts on visual resources due to the limited area involved. Further, preference would be given to locating these features on previously disturbed land. There would be no impacts on visual resources from operations at either site.

Operations— There would be no impacts on land use or visual resources at SRS or LANL.

F.7.1.4 PF-4 at LANL and H-Canyon/HB-Line and MFFF at SRS

Construction—Land use. At SRS impacts from facility modifications to support pit disassembly and conversion would take place within metal oxidation furnaces in MFFF, within H-Canyon/HB-Line, and within the K-Area Complex. At LANL, there would be no impacts on land use from PF-4 modifications as described in Section F.7.1.3. Thus, there would be no impacts on land use at either site.

Visual resources. At SRS all activities associated facility modifications to support pit disassembly and conversion would take place within structures that either already exist or are already under construction. At LANL, there would be no impacts on visual resources from PF-4 modifications as described in Section F.7.1.3. Thus, there would be no impacts on visual resources at either site.

Operations—There would be no impacts on land use or visual resources at SRS or LANL.

F.7.2 Geology and Soils

Impacts on geology and soils can occur from disturbance of geologic and soil materials during land clearing, grading, and excavation activities, and the use of geologic and soils materials during facility construction and operations. Disturbance of geologic and soil materials includes excavating rock and soil, soil mixing, soil compaction, and covering building foundations, parking lots, roadways, and fill materials. Geologic and soils materials during facility construction and operations includes crushed stone, sand, gravel, and soil used for road and building construction, as fill during construction, and as feed for processing activities during operations.

Only construction of PDCF or PDC at SRS, or enhancement of the existing pit disassembly and conversion capability in PF-4 at LANL, has the potential to affect geology and soils through disturbance of the land surface and by the use of geologic and soils materials. No land disturbance or use of geologic and soils materials is expected at SRS for optional installation of a pit disassembly capability at the K-Area Complex, for enhancing the plutonium conversion capability at H-Canyon/HB-Line, or for installation of metal oxidation furnaces in MFFF. No land disturbance or use of geologic materials is expected at LANL for pit disassembly and conversion at PF-4 under the PDC and PDCF Options and minimal land disturbance under the PF-4 and MFFF and PF-4, H-Canyon/HB-Line, and MFFF Options. **Table F–24** presents the use of geologic and soils materials during construction for each pit disassembly and conversion option.

Table F–24 Use of Geologic and Soils Materials During Construction under the Pit Disassembly and Conversion Options

Geologic and Soil Materials	*Facilities*						*Pit Disassembly and Conversion Options*			
	SRS				*LANL*					
	PDCF	*PDC*	*HC/HBL* [a]	*MFFF* [b]	*PF-4*		*PDCF*	*PDC*	*PF-4 and MFFF*	*PF-4, HC/HBL, and MFFF*
Crushed stone, sand, and gravel (tons)	190,000	530,000	0	0	0 to minimal		190,000	530,000	minimal	minimal
Soil (cubic yards)	130,000	13,000	0	0	0 to minimal		130,000	13,000	minimal	minimal

HC/HBL = H-Canyon/HB-Line; LANL = Los Alamos National Laboratory; MFFF = Mixed Oxide Fuel Fabrication Facility; PDC = Pit Disassembly and Conversion Project; PDCF = Pit Disassembly and Conversion Facility; PF-4 = Plutonium Facility; SRS = Savannah River Site.

[a] Pit disassembly would take place at the K-Area Complex; plutonium conversion would take place at HC/HBL. Installation of the pit disassembly capability at the K-Area Complex would involve no land disturbance and would not use geologic and soils materials.

[b] Pit conversion would take place in MFFF using metal oxidation furnaces.

Note: Values are rounded to two significant figures. To convert tons to metric tons, multiply by 0.90718; cubic yards to cubic meters, multiply by 0.76456.

Source: DOE/NNSA 2012; LANL 2013; SRNL 2013; SRNS 2012; WSRC 2008a.

F.7.2.1 PDCF at F-Area at SRS

Construction—As described in Section F.7.1.1, construction of PDCF at SRS would disturb about 50 acres (20 hectares) of previously disturbed land at F-Area. During construction, best management practices (BMPs) such as silt fences, straw bales, geotextile fabrics, and revegetation would be used to control erosion. The South Carolina Department of Health and Environmental Control (SCDHEC) requires a Stormwater Pollution Prevention Plan (SWPPP) under the South Carolina National Pollutant Discharge Elimination System (NPDES) General Permit for stormwater discharges from construction activities (Permit Number SCR100000) (NRC 2005:4-24, 5-2). Because this area has already been disturbed, a limited area of soils would be disturbed at any one time, and BMPs would be used to limit soil erosion. Minimal impacts on geology and soils are expected.

The total quantities of geologic and soils materials (see Table F–24) would represent small percentages of regionally plentiful resources and are unlikely to have adverse impacts on SRS geology and soils.

Operations—Operation of PDCF would involve no ground-disturbing activities, and little or no use of geologic and soils materials, and therefore, would result in minimal impacts on SRS geology and soils.

F.7.2.2 PDC at K-Area at SRS

Construction—As described in Section F.7.1.2, construction of PDC at SRS would disturb about 30 acres (12 hectares) of land at K-Area. The use of construction BMPs similar to those described in Section F.7.2.1 would likely result in minimal impacts on SRS geology and soils.

As described in Section F.7.2.1, the use of geologic and soil materials is unlikely to have adverse impacts on SRS geology and soils.

Operations—Operation of PDC would involve no ground-disturbing activities and little or no use of geologic and soils materials and, therefore, would result in minimal impacts on SRS geology and soils.

F.7.2.3 PF-4 at LANL and MFFF at SRS

Construction—At SRS, modification of capabilities in MFFF to support plutonium conversion using metal oxidation furnaces would be internal to the structure. Because installation of metal oxidation furnaces at MFFF would require no additional ground disturbance and no use of geologic materials, there would be no impacts on SRS geology and soils.

At LANL, as described in Section F.7.1.3, modification of PF-4 would temporarily disturb less than 2 acres (0.8 hectares) of land. The use of construction BMPs similar to those described in Section F.7.2.1 would likely result in minimal impacts on LANL geology and soils. This option would involve little or no use of geologic and soils materials and, therefore, would result in minimal impacts on LANL geology and soils.

Operations—Operation of facilities involved in this option would involve no ground-disturbing activities and little or no use of geologic and soils materials and, therefore, would result in minimal impacts on SRS and LANL geology and soils.

F.7.2.4 PF-4 at LANL and H-Canyon/HB-Line and MFFF at SRS

Construction—At SRS, modifications to capabilities in MFFF to support plutonium conversion using metal oxidation furnaces would be internal to the structure (see Section F.7.2.3). The minor modifications needed at the K-Area Complex and H-Canyon/HB-Line to support pit disassembly and conversion would also be internal to the respective structures. Therefore, the facility modifications proposed at F- and H-Areas under this option would neither disturb additional ground nor cause impacts on SRS soil and geology.

At LANL, as described in Section F.7.1.3, modification of PF-4 at LANL would disturb less than 2 acres (0.8 hectares) of land. The use of construction BMPs similar to those described in Section F.7.2.1 would likely result in minimal impacts on LANL geology and soils. This option would require minimal use of geologic and soils materials and, therefore, would have minimal impacts on LANL geology and soils.

Operations—Operation of facilities involved in this option would involve no ground-disturbing activities and little or no use of geologic and soils materials and, therefore, would result in minimal impacts on SRS and LANL geology and soils.

F.7.3 Water Resources

This section analyzes impacts on water resources (surface water and groundwater) for each of the pit disassembly and conversion options. Because none of the projected construction or operational requirements for any of the options is expected to conservatively require more than about 2 percent of the available water capacity at SRS or LANL (see Section F.7.7), no impacts on groundwater resources are expected under any option at either site.

F.7.3.1 PDCF at F-Area at SRS

F.7.3.1.1 Surface Water

Construction—PDCF would be constructed within F-Area between MFFF and WSB (SRNS 2012). SCDHEC requires an SWPPP that would minimize the amount of sediment in runoff to surface waters (NRC 2005).[4] As required by SCDHEC, proven construction techniques and BMPs, such as silt fences, straw bales, and sediment basins, would be installed at strategic locations to control the discharge of sediment and runoff. Detention ponds would be designed to control the release of stormwater runoff at a rate equal to or slightly less than that of the predevelopment stage. Runoff would be routed to detention ponds during earthmoving and excavation activities to minimize the potential for sediment migration to streams (NRC 2005:4-24).

Sedimentation resulting from PDCF construction would likely have minimal impacts on Upper Three Runs, which receives runoff from tributaries adjacent to the proposed construction area and discharges into the Savannah River. Ground-disturbing activities would be confined to construction areas and discharges would be in compliance with existing stormwater permits. Because surface waters would not be used to supply construction water needs, no impacts on SRS surface water quantity or availability to downstream users were identified. Subsequently, no long-term changes to stream channel morphology, aquatic habitats, or flow regimes are expected.

Accidental spills of oil, gas or diesel fuels, paint, or hydrologic fluids could affect stormwater runoff water quality. In accordance with a Spill Prevention Control and Countermeasures Plan pursuant to Title 40 of the *Code of Federal Regulations*, Part 112 (40 CFR Part 112), all spill events would be immediately reported, and for each spill event the material would be contained and remediated to the degree possible and properly disposed (NRC 2005:4-24). Impacts from localized spills on surface water quality are expected to be minimal. SRS surface runoff flows into existing storm sewer systems that provide the capability to block, divert, reroute, or temporarily contain water flows. During periods of construction when there would be the potential for spills or sediment loading, affected storm sewer zone flow paths would be secured. In the event of a chemical spill or contamination of runoff, the water could be rerouted by paved ditches and underground drainage lines from the secured storm sewer to a lined retention basin, thus averting a release of contaminants into receiving streams.

There would be no direct release of contaminated effluent during PDCF construction. Nonhazardous sanitary wastewater (sewage) would be managed using appropriate sanitary wastewater collection and treatment systems. Although it is likely that much liquid sanitary waste would be managed using portable toilets, it was conservatively assumed that all nonhazardous liquid wastes generated during PDCF construction would be managed at the Central Sanitary Waste Water Treatment Facility (CSWTF). CSWTF has sufficient hydraulic and organic capacity to treat the expected discharges from construction activities (NRC 2005:4-24); therefore, no impacts on surface water quantity or quality are expected.

At LANL, because there would be no modifications to PF-4 beyond those analyzed in the *LANL SWEIS* (DOE 2008a), there would be no potential for impacts on surface water quantity and quality.

Operations—At SRS, nonhazardous facility wastewater, stormwater runoff, and other industrial waste streams from PDCF operations (see **Table F–25**) would be managed and disposed in compliance with NPDES permit limits and requirements. Concentrations of regulated pollutants in the discharge would be well below NPDES permit limits (WGI 2005:129-149). Assuming the volume of effluent discharge from the treatment facilities would equal the volume of incoming wastewater, minimal impacts on surface water quality or flow are expected in Upper Three Runs, Fourmile Branch, and the Savannah River.

[4] *SRS hazardous facility structures are designed to engineering standards that quantify rainfall events having 10,000-year return periods for Performance Category 3 structures and 100,000-year return periods for Performance Category 4 structures. For performance category structures, the minimum drainage system design is for a 25-year, 6-hour rainfall event (WSRC 2010:8, 11).*

Table F–25 Nonhazardous Wastewater Generated During Pit Disassembly and Conversion Facility Operations

Facility Wastewater Source	*Estimated Wastewater Volumes (gallons per year)*	*Management and Disposal*
Blowdown	Process Cooling Tower – 520,000 HVAC Cooling Tower – 1,100,000 Process Chilled Water System – 1,200 Total – 1,600,000	Blowdown and condensate wastewater would be routed directly to CSWTF. The majority of sanitary wastewater would be clean HVAC condensate.
Condensates	HVAC – 1,900,000 Breathing Air – 42,000 Plant and Instrument Air – 14,000 Total – 2,000,000	
Sanitary wastewater	4,700,000	The wastewater would be delivered to CSWTF, which is capable of managing the expected volume of PDCF sanitary wastewater. [a]
Fire suppression system testing	1,400	Discharged over graded natural ground.
Vehicle wash rack	2,400	Wash water from the truck bay would be collected in an underground tank, pumped about once a month into a transport truck, and discharged through a permitted outfall.
Total:	**8,200,000**	

CSWTF = Central Sanitary Waste Water Treatment Facility; HVAC = heating, ventilation, and air conditioning; PDCF = Pit Disassembly and Conversion Facility.

[a] CSWTF has a capacity of 383,000,000 gallons per year (SRNS 2012).

Note: Values have been rounded to two significant figures. To convert gallons to liters, multiply by 3.7854.

Source: WGI 2005:5, 32, 33; SRNS 2012.

PDCF stormwater runoff would be managed using two stormwater retention basins. The north and southeast basins would have an estimated volume (for a 100-year storm) of 9.9 acre-feet (12,000 cubic meters) and 6.4 acre-feet (7,900 cubic meters), respectively, and would discharge into an unnamed stream tributary that drains into Fourmile Branch (WGI 2005:32). Management options for runoff collected within the basins include: (1) release uncontaminated water into the receiving stream, (2) reroute contaminated water to the Effluent Treatment Project (ETP) for treatment, and (3) reroute contaminated water to tanks for storage and treatment. The latter two options are not expected because contamination is not expected in stormwater runoff. Basin discharges are expected to be well below permit limits (WGI 2005:146).

Uncontaminated heating, ventilation, and air conditioning (HVAC) condensate wastewater and stormwater runoff from MFFF and WSB would be discharged into Upper Three Runs and ultimately into the Savannah River at NPDES outfall H-16 under the conditions of SCDHEC Permit SC0000175. Contamination of surface water from this outfall would be minimal because under the conditions of the permit, pollutant concentrations would be limited to safe levels (WSRC 2008a).

Surface water sources would not be used to supply water for facility operations; therefore, no decrease in surface water levels or flows is expected. Likewise, plutonium disposition actions would not limit the availability of surface water to downstream users. Uncontaminated stormwater runoff would be discharged into NPDES-permitted discharge outfalls and sanitary wastewater routed to CSWTF. Effluent from treatment of wastewater at CSWTF would be discharged to Fourmile Branch (WSRC 2006:4-66); no impacts on surface water quantity or quality are expected.

At LANL, pit disassembly and conversion of 2 metric tons (2.2 tons) of surplus plutonium material has been analyzed (DOE 2008a) and is underway. Because stormwater runoff variables, NPDES permit requirements, and effluent discharge would not be affected, and surface water sources would not be used to supply water for facility operation, no impacts on surface water quantity or quality are expected.

F.7.3.1.2 Groundwater

Construction—At SRS, no direct releases of contaminated effluent to groundwater are planned (NRC 2005:4-24). The principal potential for water contamination and infiltration would arise from construction site runoff stored in stormwater retention basins (WGI 2005:32). Regarding potential releases of contaminated runoff, adherence to SWPPPs and implementation of spill prevention and control measures meeting EPA and SCDHEC regulations would limit the likelihood of groundwater contamination. Impacts on existing groundwater contamination underlying F-Area from construction of PDCF would not be measurable because the deepest construction activities would occur approximately 60 to 80 feet (18 to 24 meters) above the groundwater contamination (SRNS 2012). Existing groundwater monitoring wells would be moved to allow for continued monitoring before the start of PDCF construction (WGI 2005:140). No direct or indirect impacts on groundwater quality are expected (NRC 2005:4-24).

At LANL, because no modifications to PF-4 are planned beyond those previously assessed (DOE 2008a), there would be no potential for impacts on groundwater resources.

Operations—At SRS, PDCF is designed with the capability to monitor liquid effluents and control discharges (WGI 2005:140; WSRC 2008a). No direct discharge of liquid effluents to groundwater during facility operation is expected. Retention or detention basins would not be used as a component of facility wastewater treatment systems. Groundwater contamination could occur, however, resulting from groundwater recharge from contaminated surface water sources or from infiltration of accidental spills. Yet it is unlikely that groundwater quality would be affected by these indirect sources because adherence to NPDES requirements and Spill Prevention and Countermeasures Control Plans would require prompt and thorough cleanup which would limit groundwater contamination (NRC 2005:4-26). No impacts on groundwater quality are expected.

At LANL, there would be no direct discharge of liquid effluents to groundwater during operation of PF-4. As at SRS (see above), the potential for impacts on groundwater from contaminated surface water sources would be minimized through adherence to NPDES requirements and implementation of spill prevention and control measures. Pit disassembly and conversion of 2 metric tons (2.2 tons) of plutonium is underway at PF-4 and would not result in additional impacts on groundwater resources.

F.7.3.2 PDC at K-Area at SRS

F.7.3.2.1 Surface Water

Construction—At SRS, surface waters would not be used to support construction of PDC within K-Area. Construction-induced stormwater runoff would be discharged from permitted outfalls (WSRC 2008a). To meet SCDHEC requirements, the site would be divided into four drainage areas with four stormwater retention basins and the outfalls K-01, K-02, K-04, and K-New (see Chapter 3, Table 3–2). The K-New outfall would drain approximately 1.24 acres (0.50 hectares) that would contain a new substation, switchgear building, diesel storage, utility building, cooling tower, and roads (SRNS 2012).

Because BMPs would be used to control stormwater runoff and soil erosion (see Section F.7.3.1.1), construction is not expected to significantly augment liquid effluents from K-Area (SRNS 2012). Construction-induced sedimentation is also expected to have minimal water quality impacts on Indian Grave Branch or Pen Branch. No long-term changes to stream channel morphology, aquatic habitats, or flow regimes are expected, and the availability of surface water for downstream users would not be limited (WSRC 2008a).

At LANL, there would be no potential for impacts on surface water resources as discussed under the PDCF Option (see Section F.7.3.1.1).

Operations—PDC water and wastewater requirements would be supported by existing infrastructure at K-Area, which includes a domestic water system, sanitary sewer system, stormwater system, fire protection system, and process sewer system. PDC operation would increase the volumes of liquid effluents from K-Area, particularly cooling tower blowdown and, to a lesser extent, noncontact cooling water. Other minor noncontact condensate sources would be piped to building drains (SRNS 2012). Water used to cool process equipment and gloveboxes would be contained within a closed loop system and separated by a heat exchanger from clean processes such as HVAC. If it becomes contaminated, this water would be trucked to ETP for treatment (Goel 2010:133). Any firefighting water used in process areas would be collected and sent to ETP for treatment prior to discharge (SRNS 2012).

PDC is expected to annually discharge about 2,300 gallons (8,700 liters) of process service water and about 8.2 million gallons (31 million liters) of sanitary sewer wastewater to CSWTF. Non-contaminated wastewater and stormwater would be discharged at one of the permitted K-Area drainage area outfalls (SRNS 2012). Surface water sources would not be used to supply water for facility operations; therefore, no decrease in surface water levels or flows is expected. No impacts on surface water quality are expected.

At LANL, impacts from pit disassembly and conversion activities at PF-4 would be minimal as discussed under the PDCF Option (see Section F.7.3.1.1).

F.7.3.2.2 Groundwater

Construction—At SRS, no liquid effluents would be directly discharged to the groundwater during construction of PDC (WSRC 2008a). As under the PDCF Option (see Section F.7.3.1.2), it is unlikely that groundwater quality would be affected by contaminated surface water sources because adherence to SWPPPs and implementation of spill prevention and control measures would minimize the potential for impacts on groundwater quality. At LANL, there would be minimal impacts on groundwater quality for the same reasons as those discussed under the PDCF Option (see Section F.7.3.1.2).

Operations—At SRS, water and wastewater treatment requirements would be met using existing K-Area and SRS infrastructure, with no projected discharge to groundwater. Groundwater would be protected from contaminated surface water sources using the same measures as those discussed under the PDCF Option (see Section F.7.3.1.2). Therefore, no impacts on groundwater quality are expected.

At LANL, there would be no additional impacts on groundwater resources as discussed under the PDCF Option (see Section F.7.3.1.2).

F.7.3.3 PF-4 at LANL and MFFF at SRS

F.7.3.3.1 Surface Water

Construction—At SRS, modification of capabilities in MFFF to support plutonium conversion using metal oxidation furnaces would be internal to the structure (SRNS 2012). Because there would be no potential for erosion or sediment loss, there would be no impacts on surface water quality.

At LANL, although modification of the existing PF-4 at TA-55 to support an enhanced pit disassembly and conversion capability would occur within an existing structure, less than 2 acres (0.8 hectares) of land could be temporarily disturbed to provide for a construction trailer and parking for construction workers (LANL 2013). Ground disturbance associated with installing this temporary trailer could lead to a short-term increase in stormwater runoff, erosion, and/or sedimentation, but potential impacts on surface-water quality would be mitigated as at SRS (see Section F.7.3.1.1) through implementation of an SWPPP. The SWPPP would be prepared, prior to commencement of construction, to implement requirements and guidance from Federal and state regulations under the Clean Water Act, including the NPDES Construction General Permit and Clean Water Act Section 401 and 404 permits. Stormwater management controls, including BMPs for increased stormwater flows and sediment loads, would be included in the construction design specifications (DOE 2008a). To monitor the effectiveness of erosion and sediment control measures, the SWPPP would include a mitigation monitoring program, such as consistent and continual inspection and maintenance, to ensure that an adequate schedule and procedures are in place and implemented. If oil, gasoline, diesel fuel, or other petroleum products spill onto the ground, they would be cleaned up, containerized, characterized, and disposed of (DOE 2011). Therefore, only minimal short-term impacts and no long-term impacts on surface water quantity and quality are expected.

Operations—At SRS, uncontaminated HVAC condensate wastewater and stormwater runoff from all MFFF operations, including pit conversion using metal oxidation furnaces, would be discharged into Upper Three Runs and ultimately into the Savannah River at NPDES outfall H-16 under the conditions of SCDHEC Permit SC0000175. Contamination of surface water from this outfall would be minimal because under the conditions of the permit, pollutant concentrations would be limited to safe levels (WSRC 2008a). Sanitary wastewater would be routed directly to CSWTF. Because surface water sources would not be used to supply water for MFFF operations, no decrease in surface water flows or impacts on surface water quality would be expected from pit conversion activities in MFFF.

At LANL, TA-55 where PF-4 is located is not in an area prone to flooding. TA-55 is dominated by sheet flow runoff conditions and does not contain natural runoff drainage features. There would be no direct discharge of industrial effluent and sanitary wastewater would be directed to the appropriate treatment facility for disposal (DOE 2011). Because surface water sources would not be used to supply water for PF-4 operations, no decrease in surface water levels or flows would be expected, nor impacts on surface water quality.

F.7.3.3.2 Groundwater

Construction—At SRS, there would be no discharge to groundwater during installation of metal oxidation furnaces at MFFF, and no potential for surface water sources during construction to affect groundwater resources. Therefore, there would be no impacts on groundwater quality.

At LANL, there would be no direct discharge to groundwater during modifications to PF-4. Because impacts on surface water quality would be protected using methods similar to those described for SRS in Section F.7.3.3.1, there would be minimal potential for contaminated surface water sources to impact groundwater. Therefore, modifications to PF-4 are expected to result in minimal impacts on groundwater quality.

Operations—At SRS, although operation of metal oxidation furnaces would slightly increase water and wastewater management requirements for MFFF, these requirements would be met by existing permits and facility and site infrastructure. No impacts on groundwater quality are expected. At LANL, augmented pit disassembly and conversion activities would similarly slightly increase water and wastewater management requirements, although these requirements would similarly be met by existing permits and facility and site infrastructure, with no expected impacts on groundwater quality.

F.7.3.4 PF-4 at LANL and H-Canyon/HB-Line and MFFF at SRS

F.7.3.4.1 Surface Water

Construction—At SRS, there would be no potential for impacts on surface water due to installation of metal oxidation furnaces in MFFF (see Section F.7.3.3.1). Modifications to the K-Area Complex to enable pit disassembly, and modification of the existing plutonium processing capability at H-Canyon/HB-Line to support pit conversion, would occur within existing structures with no potential for erosion or sediment loss that could affect surface water quality.

At LANL and as addressed in Section F.7.3.3.1, modification of PF-4 to enhance its pit disassembly and conversion capability is expected to have only minimal short-term impacts and no long-term impacts on surface water quality.

Operations—At SRS, contamination of surface water from MFFF (including plutonium oxidation) operations would be minimal, and no decrease in surface water flows or impacts on surface water quality would be expected from pit conversion activities (see Section F.7.3.3.1). Pit disassembly at the K-Area Complex would be conducted using existing infrastructure. Pit disassembly would only negligibly increase the annual volumes of liquid effluents from the K-Area Complex, including cooling tower blowdown and noncontact cooling water (see Section F.7.3.2.1). H-Canyon/HB-Line wastewater and storm water runoff would be managed and discharged in compliance with existing regulations and facility permits that require pollutant concentrations to be limited to safe levels. Uncontaminated HVAC condensate and stormwater runoff would be discharged through permitted outfalls into Upper Three Runs. Operation of H-Canyon/HB-Line for pit conversion would not significantly affect these discharges and thus would not significantly affect surface water quality.

At LANL, impacts on surface water quality are expected to be the same (minimal) as those discussed in Section F.7.3.3.1 for the PF-4 and MFFF Option.

F.7.3.4.2 Groundwater

Construction—At SRS, installation of metal oxidation furnaces at MFFF would have negligible impacts on groundwater resources (see Section F.7.3.3.2). Only minor modifications would be needed at the K-Area Complex to install a pit disassembly capability and at H-Canyon/HB-Line to provide an enhanced pit conversion capability. These modifications would require only minor usages of water and other utilities with no potential for releases to surface water that could infiltrate into and contaminate groundwater resources. Hence, there would be no impacts on groundwater quality.

At LANL, minimal impacts on groundwater quality are expected as discussed in Section F.7.3.3.2 under the PF-4 and MFFF Option.

Operations—At SRS, there would be no discharge to groundwater from operation of the K-Area Complex, H-Canyon/HB-Line, and MFFF in support of pit disassembly and conversion. Water and wastewater management requirements would be met using existing facility and site infrastructure. No impacts on groundwater quality are expected.

At LANL, no impacts on groundwater quality are expected as discussed in Section F.7.3.3.2 under the PF-4 and MFFF Option.

F.7.4 Noise

Activities under the pit disassembly and conversion options would result in noise from vehicles, construction equipment, and facility operations. The change in noise levels was considered for construction and operation of the pit disassembly and conversion options.

F.7.4.1 PDCF at F-Area at SRS

Construction—At SRS, noise associated with PDCF construction would be similar to that described in the *SPD EIS* (DOE 1999). Impacts from onsite noise sources would be small, and construction traffic noise impacts would be unlikely to result in increased annoyance of the public (DOE 1999:4-52). Any change in traffic noise associated with construction would occur onsite and along offsite local and regional transportation routes. At LANL, there would be no new construction that would increase noise levels at the site.

Operations—At SRS, noise impacts from operating PDCF would be similar to those described for existing conditions at SRS in Chapter 3, Section 3.1.4.3. Noise sources during operations could include emergency generators, cooling systems, vents, motors, material-handling equipment, and employee vehicles and trucks. Given the distances to the site boundary, noise from facility operations is not expected to result in annoyance to the public. Non-traffic noise sources are far enough away from offsite areas that the contribution to offsite noise levels would continue to be small. Noise from traffic associated with the operation of facilities is expected to increase by less than 1 decibel as a result of the increase in staffing. Some noise sources could have onsite noise impacts, such as the disturbance of wildlife. However, noise would be unlikely to affect federally listed threatened or endangered species or their critical habitats. Some change in the noise levels to which noninvolved workers are exposed could occur. Appropriate noise control measures would be implemented under DOE Order 440.1B, *Worker Protection Program for DOE (Including the National Nuclear Security Administration) Federal Employees*, to protect worker hearing.

At LANL, noise impacts from operating PF-4 would be similar to those described for existing conditions at LANL in Chapter 3, Section 3.2.4.3. Noise sources during operations could include emergency generators, cooling systems, vents, motors, material-handling equipment, and employee vehicles and trucks. Given the distances to site boundaries (about 0.6 miles [1 kilometer] from TA-55), noise from facility operations is not expected to result in annoyance to the public. Non-traffic noise sources are far enough away from offsite areas that the contribution to offsite noise levels would continue to be small (LANL 2013).

F.7.4.2 PDC at K-Area at SRS

Construction—At SRS, noise impacts from construction of PDC at K-Area would be small and construction traffic noise impacts would be unlikely to result in increased annoyance of the public. At LANL, there would be no new construction that would increase noise levels at the site.

Operations—Noise impacts from operation of PDC at SRS and PF-4 at LANL are expected to be similar to those in Section F.7.4.1 under the PDCF Option.

F.7.4.3 PF-4 at LANL and MFFF at SRS

Construction—At SRS, noise impacts from installation of metal oxidation furnaces at MFFF would be minor. At LANL, noise impacts from modifications to PF-4 would also be minor.

Operations— Noise impacts from pit conversion activities at MFFF at SRS are expected to be minor, representing a negligible addition to those resulting from operation of MFFF for MOX fuel fabrication (see Appendix G, Section G.7.4). Noise impacts from operation of PF-4 at LANL are expected to be similar to those in Section F.7.4.1 under the PDCF Option, although there would be some minor additional sources of traffic noise due to the increased level of pit disassembly and conversion activity.

F.7.4.4 PF-4 at LANL and H-Canyon/HB-Line and MFFF at SRS

Construction—At SRS, noise impacts from installation of metal oxidation furnaces at MFFF and modifications to the K-Area Complex and H-Canyon/HB-Line would be minor. At LANL, noise impacts from modifications to PF-4 would be minor also.

Operations—At SRS, noise impacts from pit disassembly and conversion activities at the K-Area Complex, H-Canyon/HB-Line, and MFFF are expected to be similar to those discussed in Section F.7.4.1 under the PDCF Option. At LANL, noise impacts from pit disassembly and conversion activities at PF-4 are expected to be similar to those discussed in Section F.7.4.3 under the PF-4 and MFFF Option.

F.7.5 Ecological Resources

This section analyzes impacts on ecological resources–including terrestrial, aquatic, and wetland resources, and threatened and endangered species–resulting from construction or modification of facilities for pit disassembly and conversion. Operation of these facilities would not further affect ecological resources. Terrestrial resources would not be further affected because additional land would not be disturbed during facility operations, and any artificial lighting and noise-producing activities would occur in areas that are already in industrial use. Aquatic and wetland resources, and threatened and endangered species, would not be further affected because additional land would not be disturbed during facility operations.

Only construction of PDCF or PDC at SRS, or enhancement of the existing pit disassembly and conversion capability in PF-4 at LANL, have the potential to affect ecological resources through disturbance of the land surface. No land disturbance is expected at SRS for pit disassembly at the K-Area Complex, for plutonium conversion using H-Canyon/HB-Line, or for metal oxidation furnaces installed at MFFF. The majority of land needed to support construction activities has already been disturbed; thus, only minimal impacts on ecological resources at SRS and LANL are expected. Section F.7.1 presents the land disturbed for each pit disassembly and conversion option.

F.7.5.1 PDCF at F-Area at SRS

Construction—Only construction at SRS is considered in this section; there would be no construction at LANL PF-4 that could result in impacts on ecological resources.

Terrestrial resources. PDCF would be constructed on about 50 acres (20 hectares) of land at F-Area. Because this area has already been disturbed, and BMPs would be used to limit soil erosion, minimal impacts on ecological resources are expected.

Aquatic resources. No aquatic resources exist within the disturbed area required for the construction and operation of PDCF at F-Area (WSRC 2008a). An SWPPP would be implemented during construction to minimize the amount of soil erosion and sedimentation that could be transported into nearby water bodies. Control measures could include sediment fences and minimizing the amount of time bare soil would be exposed. Therefore, any impacts on aquatic resources including streams, lakes, or ponds, would be minimized.

Wetlands. No wetlands exist within the disturbed area required for construction of PDCF at F-Area (WSRC 2008a). As addressed above, during construction of PDCF an SWPPP would be implemented during construction to minimize the amount of soil lost or transported into nearby water wetlands. Measures could include sediment fences and minimizing the amount of time bare soil is exposed. Therefore, any impacts on wetlands would be minimized.

Threatened and endangered species. Construction of PDCF at F-Area would take place on already disturbed land where no threatened or endangered species are known to forage, breed, nest, or occur. Therefore, no impacts on threatened or endangered species are expected (NRC 2005:4-105; WSRC 2008a).

Operations—Operation of facilities under this option would involve no ground-disturbing activities, and, therefore, would result in minimal impacts on SRS and LANL ecological resources.

F.7.5.2 PDC at K-Area at SRS

Construction— Only construction at SRS is considered in this section; there would be no construction at LANL PF-4 that could result in impacts on ecological resources.

Terrestrial resources. About 30 acres (12 hectares) of land within K-Area would be required to support construction of PDC. Of the 30 acres, approximately 5 acres (2 hectares) of undisturbed wooded land would be developed for construction of a warehouse and/or parking lot to support PDC operations (SRNS 2012). Impacts related to the clearing of 210 acres (85 hectares) of land in K-Area, including the 5 acres (2 hectares) of undisturbed land that could be disturbed by this action, would include loss of upland forest and other habitat types. These impacts were addressed in the *Environmental Assessment for the Safeguards and Security Upgrades for Storage of Plutonium Materials at the Savannah River Site* (DOE 2005d). The accompanying Finding of No Significant Impact concluded that the proposed action is not expected to have measurable impacts on the human environment including threatened and endangered species, wetlands, and migratory avian species (DOE 2005e).

It is expected that a planned sanitary tie-in connecting K-Area to a lift station at C-Area would be constructed on previously disturbed land, resulting in no additional impacts on terrestrial resources (Reddick 2010). If portions of the sanitary tie-in are routed through previously undisturbed land, however, impacts could include loss of upland forest and other habitat, and temporary disturbance of wildlife. Preconstruction surveys and consultations with the U.S. Fish and Wildlife Service and the South Carolina Department of Natural Resources would be conducted, if appropriate, and impacts on sensitive animal and plant species would be minimized with as-necessary implementation of mitigation actions.

Aquatic resources. Although new construction would be required in both undisturbed and disturbed areas of K-Area to support PDC operations, no substantial aquatic resources exist within either of these areas. Control measures to minimize erosion and sediment loss would be implemented similar to those discussed in Section F.7.5.1, and minimal impacts on aquatic resources are expected. No impacts on aquatic resources are expected resulting from construction of a sanitary tie-in connecting K-Area to a lift station at C-Area.

Wetlands. As discussed above, no wetlands exist within the area required for the structures to be constructed at K-Area for PDC. Because measures would be taken to minimize erosion and sediment loss during construction (similar to those discussed in Section F.7.5.1), minimal impacts on wetlands are expected. No impacts on wetlands are expected to result from construction of a sanitary tie-in connecting K-Area to a lift station at C-Area.

Threatened and endangered species. No threatened or endangered species are known to forage, breed, nest, or occur on any of the land required for the structures to be constructed at K-Area for PDC. Therefore, no impacts are expected (DOE 2005d; WSRC 2006). In addition, because no threatened or endangered species occur within or nearby the area surrounding the proposed construction sites, they would not be affected by noise produced by construction activities. No impacts on threatened or endangered species are expected resulting from construction of a sanitary tie-in connecting K-Area to a lift station at C-Area.

Operations—Operation of facilities under this option would involve no ground-disturbing activities, and, therefore, would result in minimal impacts on SRS and LANL ecological resources.

F.7.5.3 PF-4 at LANL and MFFF at SRS

Construction—At SRS, construction or modification of facilities used for pit disassembly and conversion would take place within existing structures on already disturbed land. There would be no potential for erosion and sediment loss during construction to impact aquatic resources or wetlands, and no potential for impacts on threatened and endangered species. Therefore, facility construction or modification would not cause impacts on terrestrial, aquatic, and wetland resources, or threatened and endangered species.

At LANL, as described in Section F.7.1.3, modification of PF-4 at LANL would disturb less than 2 acres (0.8 hectares) of land for a temporary trailer and construction parking. While a site has not yet been identified, preference would be given to disturbed land and appropriate site permits would be acquired through the Permit Requirements Identification Process to ensure that no ecological resources would be impacted (LANL 2013).

Operations—Operation of facilities under this option would involve no ground-disturbing activities and thus would result in minimal impacts on SRS and LANL ecological resources.

F.7.5.4 PF-4 at LANL and H-Canyon/HB-Line and MFFF at SRS

Construction—At SRS, construction or modification of facilities used for pit disassembly and conversion would take place within existing structures on already disturbed land. There would be no potential for erosion and sediment loss during construction to impact aquatic resources or wetlands, and no potential for impacts on threatened and endangered species. Therefore, facility construction or modification activities would not cause impacts on terrestrial, aquatic, and wetland resources, or threatened and endangered species.

At LANL, as described in Section F.7.1.3, modification of PF-4 at LANL would disturb less than 2 acres (0.8 hectares) of land for a temporary trailer and construction parking. While a site has not yet been identified, preference would be given to disturbed land and appropriate site permits would be acquired through the Permit Requirements Identification Process to ensure that no ecological resources would be impacted (LANL 2013).

Operations—Operation of facilities under this option would involve no ground-disturbing activities and, thus, would result in minimal impacts on SRS and LANL ecological resources.

F.7.6 Cultural Resources

SRS manages and protects its cultural resources, including prehistoric, historic, American Indian, and paleontological resources, under the terms of agreements and through a site use review process to evaluate potential impacts imposed by the scope of work intended prior to taking any action. The Savannah River Archaeological Research Program (SRARP) of the South Carolina Institute of Archeology and Anthropology at the University of South Carolina assists DOE in determining how the project can proceed to minimize or mitigate potential impacts on cultural resources (Wingard 2010).

LANL manages and protects its cultural resources as detailed in *A Plan for the Management of the Cultural Heritage at Los Alamos National Laboratory, New Mexico* (LANL 2006) and governed by the *Programmatic Agreement Between the U.S. Department of Energy, National Nuclear Security Administration, Los Alamos Site Office, the New Mexico State Historic Preservation Office and the Advisory Council on Historic Preservation Concerning the Management of the Historic Properties of Los Alamos National Laboratory, New Mexico* (DOE 2006).

The land area required for construction or modification of facilities at SRS and LANL for pit disassembly and conversion is relatively small; would take place primarily in previously disturbed or developed areas; and would be surveyed and monitored, as appropriate, in compliance with existing agreements and procedures. Impacts from operations would be negligible at either site, and are not further addressed, because security measures at the sites would restrict access to any nearby prehistoric, historic, American Indian, and paleontological resources.

F.7.6.1 PDCF at F-Area at SRS

This section only addresses construction impacts at SRS. There would be no new construction at LANL that would result in impacts on cultural resources.

Prehistoric Resources. PDCF would be constructed within F-Area adjacent to MFFF and WSB, which are currently under construction. F-Area is classified as site industrial and is within the Industrial Core Management Area (DOE 2005b:4, 2005c:56). Prior to MFFF construction activities, this entire area was surveyed for cultural resources and 15 prehistoric sites were identified; 7 have been deemed eligible for listing on the National Register of Historic Places (NRHP). Because two of these sites would be directly affected by construction activities, a data recovery plan was submitted and approved by the South Carolina State Historic Preservation Office (SHPO). Subsequently, prior to the commencement of construction activities, SRARP excavated the sites to mitigate impacts caused by the construction of the MFFF and potential construction of PDCF (NRC 2005:3-38, 5-14). Data recovery of these sites was completed, as well as appropriate monitoring, which ensures that DOE, through SRARP, exceeded the recommendations in the data recovery plans (NRC 2005:App. B) and met the terms of the Memorandum of Agreement (SRARP 1989:App. C) regarding mitigation of impacts on archaeological sites within the surplus plutonium disposition facilities project area (King 2010).

In 2008 and 2009, 75 acres (30 hectares) in F-Area were surveyed for the purpose of constructing a laydown yard for PDCF. This fieldwork located four of five previously recorded sites and identified a new site, as well as five artifacts. Because the artifacts have no research potential there would be no adverse impact; however, two sites are potentially eligible for nomination to the NRHP so it is recommended that they be avoided. SRARP expects an amended site use permit to facilitate this recommendation (SRARP 2009:10-12).

*Historic Resources. T*here would be no impacts on historic resources associated with the Cold War era in F-Area because the proposed alternative action involves new construction and does not affect existing facilities.

American Indian Resources. Due to the developed nature of F-Area, it is highly unlikely that either vegetation important to American Indians, or other resources of concern, would be found within the area. Thus, impacts on American Indian resources resulting from actions necessary to implement pit disassembly and conversion would be unlikely.

Paleontological Resources. Paleontological resources are unlikely to be found within F-Area due to the highly disturbed nature of the area. Thus, impacts on paleontological resources resulting from implementing pit disassembly and conversion would be unlikely.

F.7.6.2 PDC at K-Area at SRS

This section only addresses construction impacts at SRS. There would be no new construction at LANL that would result in impacts on cultural resources.

Prehistoric Resources. PDC would be constructed at K-Area, which is classified as site industrial (DOE 2005b:4, 2005c:62). The majority of the land required for PDC construction has been previously disturbed with the exception of approximately 5 acres (2 hectares), which are currently wooded. Because construction would take place within the built-up portion of K-Area and previous archeological reviews did not reveal any identified sites where land disturbance would occur, impacts on prehistoric resources are unlikely. Although six archeological sites have been identified in the vicinity of the project boundary, none would be disturbed (Blunt 2010; DOE 2005d:13-14; SRARP 2006:10).

Associated with establishing pit disassembly and conversion capabilities in K-Area would be construction of a 2-mile (3.2-kilometer) sanitary tie-in connecting K-Area to a lift station in C-Area. Although the exact route is undetermined at this time, it would likely use existing easements; thus, it is not expected to impact prehistoric resources. This would be verified prior to construction through the SRS site use clearance process and, if necessary, cultural resource surveys would be conducted (Reddick 2010; SRARP 1989:App. C).

Historic Resources. The K-Area reactor building is an NRHP-eligible structure itself and within the context of the Cold War Historic District. This facility is considered highly significant because it was primary to SRS's mission and housed a part or all of one of the site's nuclear production processes and is valued for its good integrity in that the building contains parts of its original equipment and can still provide information about its past. As such, proposed changes that may impact the historic fabric of this building, or to any intact historically significant equipment, would be studied, discussed with the South Carolina SHPO, and avoided, mitigated, or minimized (DOE 2005a:16, 44, 61, 67).

American Indian Resources. Due to the developed nature of K-Area, it is highly unlikely that either vegetation important to American Indians, or other resources of concern, would be found within the area. Thus, impacts on American Indian resources resulting from actions necessary to implement pit disassembly and conversion would be unlikely.

Paleontological Resources. Paleontological resources are unlikely to be found within K-Area due to the highly disturbed nature of the area. Thus, impacts on paleontological resources resulting from implementing pit disassembly and conversion would be unlikely.

F.7.6.3 PF-4 at LANL and MFFF at SRS

Prehistoric Resources. At SRS, metal oxidation furnaces would be installed in MFFF at F-Area. Because construction would be internal to the MFFF structure, there would be no impacts on prehistoric resources.

At LANL, modification of PF-4 could require less than 2 acres (0.8 hectares) for a temporary trailer and construction parking. Although a site has not been identified, preference would be given to previously disturbed land and appropriate permits would be acquired including adherence to provisions set forth in the *Programmatic Agreement Between the U.S. Department of Energy, National Nuclear Security Administration, Los Alamos Site Office, the New Mexico State Historic Preservation Office and the*

Advisory Council for Historic Preservation Concerning the Management of the Historic Properties of Los Alamos National Laboratory, New Mexico (DOE 2006). A rock shelter has been identified in TA-55 as eligible or potentially eligible for listing on the NRHP which would be taken into consideration in siting the temporary construction site.

Historic Resources. There would be no impacts on historic resources associated with the Cold War era at SRS or LANL because the option involves relatively modern or new facilities. Modifications to PF-4 would conform to requirements in *A Plan for the Management of the Cultural Heritage at the Los Alamos National Laboratory, New Mexico* (LANL 2006).

American Indian Resources. Due to the developed nature of F-Area at SRS and TA-55 at LANL, it is highly unlikely that either vegetation important to American Indians, or other resources of concern, would be found within the area. Thus, impacts on American Indian resources resulting from actions necessary to implement pit disassembly and conversion would be unlikely.

Paleontological Resources. Paleontological resources are unlikely to be found within F-Area at SRS or TA-55 at LANL due to the highly disturbed nature of the area. Thus, impacts on paleontological resources resulting from implementing pit disassembly and conversion would be unlikely.

F.7.6.4 PF-4 at LANL and H-Canyon/HB-Line and MFFF at SRS

*Prehistoric Resources. A*t SRS and as discussed in Section F.7.6.3, there would be no impacts on prehistoric resources from installation of metal oxidation furnaces in MFFF. Although the capabilities in H-Canyon/HB-Line and the K-Area Complex could be modified to support pit disassembly and conversion, the modifications would occur inside existing structures so there would be no impacts on prehistoric resources at H- or K-Area. At LANL, there would be no impacts on prehistoric resources from modification of PF-4.

Historic Resources. At SRS, the H-Canyon building, including HB-Line, and any other attached auxiliaries have been identified as NRHP-eligible individually, as well as collectively within the context of the Cold War Historic District. The H-Canyon building and its auxiliary facilities are considered highly significant given that these structures were primary to SRS's mission and housed part or all of the site's nuclear production processes (DOE 2005a:39, 58, 61, 66). Photographic mitigation and oral histories have been initiated and, when completed, will be distributed to the South Carolina SHPO to determine what, if any, further action is required in order to preserve the historical integrity of these facilities (DOE 2008b:4). The proposed facility modifications would be assessed in accordance with the *Cold War Historic Preservation Program* (Sauerborn 2011). There would be no impacts on historic resources at MFFF because the facility is under construction, and no impacts on historic resources at the K-Area Complex because of the limited scope of the modifications.

At LANL, no impacts are expected on historic resources associated with the Cold War era as discussed in Section F.7.6.3.

American Indian Resources. Due to the developed nature of F-, H-, and K-Areas at SRS and TA-55 at LANL, it is highly unlikely that vegetation important to American Indians, or other resources of concern, would be found within these areas. Thus, impacts on American Indian resources resulting from actions necessary to implement pit disassembly and conversion would be unlikely.

Paleontological Resources. Paleontological resources are unlikely to be found within F-, H-, and K-Areas at SRS and TA-55 at LANL due to the highly disturbed nature of the area. Thus, impacts on paleontological resources resulting from implementing pit disassembly and conversion would be unlikely.

F.7.7 Infrastructure

This section analyzes impacts of different pit disassembly and conversion options on infrastructure resources. The resources being analyzed are electricity, fuel oil, and water. **Table F–26** summarizes the peak annual resource requirements that would be required for construction under the pit disassembly and conversion options. **Table F–27** summarizes the peak annual resource requirements that would be required for operations under the pit disassembly and conversion options.

F.7.7.1 PDCF at F-Area at SRS

Construction—At SRS, construction of PDCF would annually use less than 1 percent of SRS's available electrical capacity (about 4.1 million megawatt-hours) and available water capacity (about 2.63 billion gallons [9.96 billion liters]). Fuel oil usage is not limited by site capacity because oil fuel is delivered to the site as needed. However, construction of PDCF is estimated to require 390,000 gallons (1,500,000 liters) of fuel oil per year, approximately 95 percent of SRS's current annual fuel usage (about 410,000 gallons [1,600,000 liters] per year—see Chapter 3, Section 3.1.9). At LANL, there would be no additional construction that would impact infrastructure resources.

Operations—At SRS, operation of PDCF would annually use approximately 2 percent of SRS's available electrical capacity, and water usage at PDCF would annually use less than 1 percent of the site's available capacity. Fuel oil usage is estimated at approximately 9 percent of SRS's current annual fuel usage. At LANL, pit disassembly and conversion activities at PF-4 would annually use about 0.3 and 0.7 percent, respectively, of LANL's available electrical and water capacity (conservatively, about 352,000 megawatt-hours of electricity and 114 million gallons [430 million liters] of water). No additional fuel oil would be needed at PF-4 to support pit disassembly and conversion.

F.7.7.2 PDC at K-Area at SRS

Construction—At SRS, construction of PDC would use less than 1 percent of SRS's available electrical capacity and available water capacity, but require about 300,000 gallons (1,100,000 liters) of fuel oil, approximately 73 percent of SRS's current annual fuel usage. At LANL, there would be no additional construction that would impact infrastructure resources.

Operations—At SRS, operations would use approximately 1 percent of SRS's available electrical capacity, and less than 1 percent of the site's available water capacity. Fuel oil is not expected to be required beyond the fuel oil already required for other ongoing operations at K-Area. At LANL, resource use for pit disassembly and conversion would be the same as that for the PDCF Option.

F.7.7.3 PF-4 at LANL and MFFF at SRS

Construction—At SRS, installation of metal oxidation furnaces at MFFF to provide a pit conversion capability would be performed during construction of the overall MFFF or during its operation. In either event, resource use would be minimal. At LANL, modifications to PF-4 would conservatively use less than 1 percent of the available LANL electrical capacity, and less than 1 percent of the available LANL water capacity. Fuel oil use is estimated at 2,800 gallons (11,000 liters) per year at PF-4.

Operations—At SRS, operation of metal oxidation furnaces at MFFF would have minimal impacts on available SRS capacities. No additional fuel oil would be required to support metal oxidation furnace operations at MFFF. At LANL, annual operations at PF-4 related to pit disassembly and conversion would conservatively require less than 1 percent of LANL's available electrical capacity and about 2 percent of LANL's available water capacity. No additional fuel oil would be required to support operations as a result of pit disassembly and conversion activities at PF-4.

Table F–26 Peak Annual Construction Infrastructure Requirements Associated with Pit Disassembly and Conversion Options

	Facilities					*Pit Disassembly and Conversion Options*			
	SRS				*LANL*				
Resource	***PDCF***	***PDC***	***H-Canyon/ HB-Line*** [a]	***MFFF*** [a]	***PF-4*** [b]	***PDCF***	***PDC***	***PF-4 and MFFF***	***PF-4, H-Canyon/HB-Line, and MFFF***
Electricity (megawatt-hours)	15,000	16,000	minimal	minimal	83	15,000	16,000	83	83
Water (gallons)	2,600,000	1,100,000	minimal	minimal	340,000	2,600,000	1,100,00	340,000	340,000
Fuel oil (gallons) [c]	390,000	300,000	minimal	minimal	2,800	390,000	300,000	2,800	2,800

LANL = Los Alamos National Laboratory; MFFF = Mixed Oxide Fuel Fabrication Facility; PDC = Pit Disassembly and Conversion Project; PDCF = Pit Disassembly and Conversion Facility; PF-4 = Plutonium Facility; SRS = Savannah River Site.

[a] Modifications to the K-Area Complex, H-Canyon/HB-Line, and MFFF to support pit disassembly and conversion activities are expected to result in minimal additional infrastructure requirements and to fall within SRS's current infrastructure requirements.

[b] The values reflect resource use for modifications to PF-4 to support an enhanced pit disassembly and conversion capability under the PF-4 and MFFF and PF-4, H-Canyon/HB-Line, and MFFF Options. No additional construction resource use is expected at PF-4 under the PDCF and PDC Options.

[c] Construction fuel oil includes gasoline.

Note: Values are rounded to two significant figures. To convert gallons to liters, multiply by 3.7854.

Source: LANL 2013; SRNL 2013; SRNS 2012; WSRC 2008a.

Table F–27 Peak Annual Operational Infrastructure Requirements Associated with Pit Disassembly and Conversion Options

	Facilities					*Pit Disassembly and Conversion Options*			
	SRS				*LANL*				
Resource	***PDCF***	***PDC***	***H-Canyon/ HB-Line*** [a]	***MFFF*** [b]	***PF-4*** [c]	***PDCF***	***PDC***	***PF-4 and MFFF***	***PF-4, H-Canyon/HB-Line, and MFFF***
Electricity (megawatt-hours)	92,000	41,000	minimal	150	960 / 1,900	93,000	42,000	2,100	2,100
Water (gallons)	16,000,000	16,000,000	minimal	minimal	820,000 / 2,700,000	17,000,000	17,000,000	2,700,000	2,700,000
Fuel oil (gallons)	35,000	170,000	minimal	0	0 / 0	35,000	170,000	0	minimal

LANL = Los Alamos National Laboratory; MFFF = Mixed Oxide Fuel Fabrication Facility; PDC = Pit Disassembly and Conversion Project; PDCF = Pit Disassembly and Conversion Facility; PF-4 = Plutonium Facility; SRS = Savannah River Site.

[a] Annual operations at the K-Area Complex and H-Canyon/HB-Line to support pit disassembly and conversion activities are expected to result in minimal additional infrastructure requirements beyond those already included in SRS's current infrastructure requirements. About 41 megawatt hours of electricity and 31,000 gallons of water at DWPF could be annually attributable to vitrification of waste resulting from pit conversion activities at H-Canyon/HB-Line.

[b] Annual operation of metal oxidation furnaces at MFFF to support pit disassembly and conversion activities is expected to result in minimal additional requirements for water and no additional requirements for fuel oil at MFFF beyond those already included in MFFF's current infrastructure requirements (see Appendix G).

[c] The first value reflects pit disassembly and conversion activities at PF-4 under the PDCF and PDC Options. The second value reflects pit disassembly and conversion activities at PF-4 under the PF-4 and MFFF and PF-4, H-Canyon/HB-Line, and MFFF Options. Pit disassembly and conversion at PF-4 is not expected to result in increased use of fuel oil under any option.

Note: Values are rounded to two significant figures. To convert gallons to liters, multiply by 3.7854.

Source: LANL 2013; SRNL 2013; SRNS 2012; WSRC 2008a.

F.7.7.4 PF-4 at LANL and H-Canyon/HB-Line and MFFF at SRS

Construction—At SRS, modifications to the K-Area Complex to enable pit disassembly, and at H-Canyon/HB-Line to support pit conversion, would have minimal impacts on SRS infrastructure. Similarly and as discussed in Section F.7.7.3, installation of metal oxidation furnaces at MFFF would have a minimal effect on SRS infrastructure. At LANL, resource use from modifications to PF-4 would be the same as that under the PF-4 and MFFF Option (see Section F.7.7.3).

Operations—At SRS, the additional infrastructure requirements associated with operating a pit disassembly glovebox in the K-Area Complex and metal oxidation furnaces at MFFF would be minimal compared to the other infrastructure requirements at these facilities. Pit conversion operations at the H-Canyon/HB-Line would require minimal additional electricity, water or fuel oil compared to current infrastructure requirements associated with continued operation of this facility. These requirements are already reflected in SRS's baseline operations so there would not be any additional impacts on SRS's available electrical or water capacity. At LANL, resource use from pit disassembly and conversion activities at PF-4 would be the same as that under the PF-4 and MFFF Option (see Section F.7.7.3).

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